COMBATING AND PREPARING FOR RADIOLOGICAL TERRORISM: THE INTERNATIONAL DIMENSION

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INTRODUCTION

The threat of radiological terrorism was not born on September 11, 2001. Long before then, the international community was taking steps to improve the security of radioactive materials that could fuel radiological dispersal devices (RDDs) – one type of which is popularly known as a "dirty bomb." Nonetheless, the attacks of 9/11, although they did not spread radioactive materials, and the subsequent anthrax attacks in the United States sounded the alarm that some non-state actors may turn to unconventional forms of terrorism to strike fear in the hearts of the targeted public and political leaders as well as to increase the level of violence in terrorist attacks. While all forms of terrorism demand preventive and responsive actions, this paper focuses on the threat of radiological terrorism – that is, that non-state actors, or terrorists, can seize radioactive materials and use them to release radioactivity with the intention of harming the public. This paper concludes by outlining efforts the international community can take to protect against this threat.

Due to space limitations, I will not discuss the other nuclear terrorist threats. I will just point out that the Center for Nonproliferation Studies will be publishing this April a book that will systematically assess the different faces of nuclear terrorism. These faces, or aspects, are:

- the aforementioned threat of terrorist acquisition of radioactive materials and the resulting release of radioactivity through use of an RDD or other radiation emission mechanism;
- terrorist attack on or sabotage of nuclear facilities, such as nuclear power plants, to cause the release of radioactivity to the environment;
- terrorist theft or purchase of fissile material (highly enriched uranium or plutonium) usable in a crude nuclear weapon, or an improvised nuclear device; and
- terrorist seizure of an intact nuclear weapon.

NATURE OF THE PROBLEM

Although there have been no reported uses of radiological dispersal devices or dirty bombs, the perceived threat of radiological attack has increased in recent years. One reason for this perception is that at least two terrorist groups have expressed interest in using radioactive materials to further their objectives. Al Qaeda has reportedly been seeking this capability, and the Chechen rebels have demonstrated on a couple of occasions that they have radioactive materials. For example, in November 1995, Shamil Basayev, a Chechen rebel leader, directed a television crew to a container with a small quantity of cesium-137 in Moscow's Izmailovsky Park. Cesium-137 is a radioactive isotope that is prevalently used in a variety of commercial radioactive sources. Importantly, the Chechen rebels did not detonate the radioactive material; instead, they just demonstrated their potential for such an attack. Therefore, the effect of this incident was completely psychological. This observation highlights a critical distinction between a nationalist-separatist group, such as the Chechen rebels, and a politico-religious group, such as al Qaeda. National-separatists have a specific constituency that they would take pains to not alienate. Thus, they might be self-deterred from launching unconventional terrorist attacks. In contrast, a politico-religious terrorist organization that is seeking to ratchet up the level of violence in attacks might not experience the same sort of qualms or restraints as national-separatists experience.

Another cause for the increased concern over radiological attack is the widespread news media reporting of dirty bombs, raising public awareness and thus priming the pump for terrorists, while not necessarily educating people about the real dangers of radiological terrorism. First, it is important to state what RDDs are not. They are not weapons of mass destruction. Few, if any, people would die soon after exposure to the ionizing radiation from a typical dirty bomb. Although in certain highly specialized scenarios, many more could die. In the long term, many people could develop cancer from exposure to the ionizing radiation from an RDD, but the number of fatalities would pale in comparison to the quantity of deaths resulting from a nuclear weapon explosion. However, RDDs can be thought of as weapons of mass disruption. Many people fear radioactivity and would tend to panic during an RDD attack, and radioactive contamination could lead to the destruction of valuable property and loss of businesses. In sum, the main effects of an RDD attack are psychological and economic.[1]

To illustrate the contamination, economic, and long term health effects, the Federation of American Scientists (FAS) in March 2002 simulated dirty bomb attacks against Washington, DC and New York City. Here, this paper summarizes the results of the FAS study, which was done by Henry Kelly, Michael Levi, Robert Nelson, and Jaime Yassif. In the first scenario for an attack on New York, they simulated the dispersal of 10,000 curies of cobalt-60 (a highly penetrating gamma emitter – thus presenting an external health hazard), which they assume was acquired from a food irradiation facility. A source of this size is considered rather large, and people handling such a source would have to take special precautions, including shielding the source material, to prevent receiving a lethal dose of ionizing radiation. FAS posited a dispersal that starts at the lower tip of Manhattan and picked a wind pattern that would lead to near maximum dispersal of the

[1] A recently published study clearly makes this point; Peter D. Zimmerman with Cheryl Loeb, "Dirty Bombs: The Threat Revisited," *Defense Horizons*, No. 38, Center for Technology and National Security Policy, National Defense University, January 2004.

radioactivity over this island. The simulation predicted that, "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."[2] FAS also estimated that much of Manhattan would be contaminated to levels comparable to the radioactive contamination that resulted in permanent exclusion zones in areas surrounding the Chornobyl nuclear power plant. Vast areas in Ukraine and Belarus, in particular, were heavily contaminated because of the radiation emitted from the 1986 Chornobyl accident.

Next, FAS simulated the dispersal of 10 curies of americium-241 (an alpha emitter – only presenting an internal health hazard) from a typical source used in oil well logging. The simulation used only one pound of TNT to spread the radioactive material in Manhattan. Because of the internal health risk posed by an alpha-emitter, people in the immediate area of the blast should evacuate. Within half an hour, the simulation estimated that the radioactive plume area would cover some 20 city blocks. The radioactive materials that settled out of the radioactive cloud would pose a long-term hazard, if they were not cleaned up, because some material could be re-suspended in the air and then inhaled into the lungs. If decontamination efforts were not successful, EPA safety guidelines could be interpreted to require demolition of buildings. The resulting cost to demolish and rebuild "would exceed fifty billion dollars."[3]

The above scenarios indicate that RDDs would likely not lead to great loss of life within the near term after a radiological attack. Nonetheless, dirty bombs can result in substantial property and financial damage. Moreover, the public would probably experience substantial psychological and social effects. Finally, it is important to realize that other countries in addition to the United States could be targeted for radiological

[2] Henry Kelly, Testimony before the Senate Foreign Relations Committee, March 6, 2002, available at www.fas.org. The plots of the plume patterns are also available at that Web site. The cancer risks cited in the FAS study assume a residence time of 40 years within the contaminated area and that no decontamination would occur. Such assumptions were based on U.S. Environmental Protection Agency guidelines for determining cancer risk. The study also assumed "light winds of 2 mph and complete dispersal of the materials"; Michael Levi and Henry Kelly, "Dirty Bombs Continued," *FAS Public Interest Report*, May/June 2002.
[3] Kelly Testimony.

attack. The source materials are prevalent throughout the world and remain relatively accessible.

What steps should the world take to guard against and to prepare for a radiological attack? In previous publications, I and co-authors have emphasized prioritizing security enhancements of high-risk radioactive sources – the small fraction of sources that truly pose a greater hazard to health and property if used in an RDD.[4] Security improvements should be targeted at all stages of a radioactive source's lifecycle from production of radioisotopes to disposal of no longer needed sources. Only seven reactor-produced radioisotopes pose the greatest security concerns when present in relatively large amounts in commercial radioactive sources. These isotopes are: americium-241, californium-252, cesium-137, cobalt-60, iridium-192, plutonium-238, and strontium-90.

Because the small fraction of high-risk radioactive sources comprises in absolute numbers tens of thousands of sources and because these are employed in virtually every state of the world, securing these materials improving regulatory controls will require many years of sustained effort. Thus, there will be a substantial period of time during which the likelihood of a non-state actor seizing high-risk sources will remain relatively large compared to the probability of terrorist acquisition of fissile material in which stocks tend to be smaller in number and are usually under tighter controls. The relatively great likelihood of radiological attack in coming years implies a relatively high risk that such an event will occur. To reduce this risk, the international community urgently needs to take steps to manage the other factor that contributes to risk. That is, because risk is the product of probability (or likelihood) and consequences, the world community can further

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[4] See, for example, Charles D. Ferguson, Tahseen Kazi, and Judith Perera, *Commercial Radioactive Sources: Surveying the Security Risks*, Occasional Paper No. 11, Center for Nonproliferation Studies, Monterey Institute of International Studies, January 2003, available at http://www.cns.miis.edu/pubs/opapers/op11/index.htm; the executive summary of this report was reprinted in the publication "Nuclear Terrorism," *Disarmament Forum*, No. 2, UNIDIR, 2003, pp. 23-28, available at: http://www.unidir.org/pdf/articles/pdf-art1909.pdf; and Charles D. Ferguson, "Reducing the Threat of RDDs," *IAEA Bulletin*, Vol. 45, No. 1, 2003, available at http://www.iaea.org/Publications/Magazines/Bulletin/Bull451/article3.pdf. All of these publications present recommendations for improving regulatory controls and security of radioactive sources.

reduce security risks by increasing efforts to manage the consequences of a radiological attack.

RECOMMENDATIONS

Due to space constraints, I will outline three proactive steps that states and international organizations, such as the UN, can take to prepare the world community for a dirty bomb attack to continue to improve regulatory controls over radioactive materials.

(1) Educate people and their political leaders. The public and officials need to understand the real versus perceived dangers of dirty bombs. A credible education campaign can work toward psychologically immunizing the public by teaching people that few would likely be harmed soon after being exposed to ionizing radiation from a radiological attack and that the best defense to enhance chances of survival is to remain calm and listen to instructions from authorities.[5] Of course, such an educational effort would not be easy. Many people have an in-grained fear of radioactivity. Therefore, world leaders need to start now to prepare the public for an RDD event. If the public will not be easily scared by a dirty bomb attack, terrorists inclined toward nuclear terrorism may be dissuaded from launching such an attack.

(2) Prepare now for the all but inevitable radiological attack. Concurrent with the above action, the world needs to put more effort toward training first responders and officials responsible for protecting public health and safety, toward researching and developing effective decontamination techniques, and toward stockpiling emergency response and decontamination equipment in strategic locations where this gear can be rapidly accessed and quickly applied to the site of a radiological attack. Additionally, the

[5] In February 2003, the World Health Organization distributed through the Internet information on how to respond to a dirty bomb attack; this document is available at http://www.who.int/ionizing_radiation/en/WHORAD_InfoSheet_Dirty_Bombs21Feb.pdf. Also in 2003, RAND published a guide to help individuals prepare for unconventional terrorist attacks; Lynn E. Davis, Tom LaTourrette, David E. Mosher, Lois M. Davis, and David R. Howell, *Individual Preparedness and Response to Chemical, Radiological, Nuclear, and Biological Terrorist Attacks: A Quick Guide*, RAND, 2003, available at http://www.rand.org/publications/MR/MR1731.1/ RAND's primary recommendation for response during a radiological attack is to "avoid inhaling dust that could be radioactive." On February 5, 2004, the Health Physics Society released a position statement on "Guidance for Protective Actions Following a Radiological Terrorist Event," available at www.hps.org.

UN and IAEA can facilitate preparedness by establishing active lines of communication among first responders and authorities across state borders in order to learn from each other's training experiences. This communication network could also serve as a conduit to allow regulatory officials to exchange information about licensing of high-risk radioactive materials. This network would help support the regulatory improvements outlined below.

The UN should consider how it can encourage more states to join the Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency. Parties to this convention can ask for assistance from the IAEA and other states parties in the event of a radiological emergency, such as a dirty bomb attack. Currently, more than 80 parties, but still less than half the world's states, are parties to this convention.

(3) Strength through greater numbers and networking. That is, apply leverage through international organizations, such as the UN and the IAEA, and multilateral cooperation among states to carry out the above two tasks and to continue to strengthen the regulatory controls of radioactive sources.

"The international community today is least well prepared to address the nuclear terrorist threat [RDDs] regarded as most likely by many experts"[6] because, historically, radiation safety concerns trumped security considerations. In retrospect this order of priorities was appropriate because there have been many radiation safety incidents, but, as of yet, no dirty bomb attacks. Accordingly, most conventions and international regulations and guidelines limit their provisions to matters of safety rather than security. Nonetheless, in 1992, the Basic Safety Standards for radiation protection issued by the IAEA contained some language devoted to security, and the draft Convention on the Suppression of Acts of Nuclear Terrorism submitted by the Russian Federation in 1996 also would have provisions dealing with radioactive materials in the convention's present form. However, the concentrated effort to develop security standards did not seriously begin until the

[6] William C. Potter, "The Challenge of Nuclear Terrorism: Threat Assessments and Recommendations to Enhance International Security and Safety," Discussion Paper for Thirty-Ninth Session of the United Nations Secretary-General's Advisory Board on Disarmament Matters, Geneva, July 17-19, 2002.

1998 radioactive source safety and security conference in Dijon, France. This international meeting of regulatory and radiation safety experts led to another major conference in December 2000 in Buenos Aires.

Moreover, these experts began to craft the Code of Conduct on the Safety and Security of Radioactive Sources. This non-binding code is designed to promote best practices. A companion document on the Categorization of Radiation Sources discusses which sources pose high safety and security risks. After 9/11, representatives of many IAEA member states realized that they needed to revise the Code and the Categorization to reflect the heightened security concerns. They completed the revision in July 2003, and the IAEA Board of Directors approved it in September 2003. Moreover, soon after 9/11, the IAEA and several member states worked diligently in creating the Action Plan to combat nuclear terrorism. "Both the Russian draft convention and the IAEA Action Plan emphasize the need for national governments to adopt legislative, administrative, and technical measures to ensure the physical protection of radioactive material. The IAEA Action Plan also establishes a program to provide assistance to member states in their efforts to locate and secure or dispose of orphan sources [those sources that have fallen outside of regulatory controls]."[7]

Among the laudable provisions of the Code of Conduct is an emphasis on improving the export and import controls of all states. In many states, even those that are considered "advanced" industrialized states, export control regulations do not require detailed reviews by government officials to verify that the recipient is properly licensed to safety and securely handle a radioactive source. Strengthening the export control system will obviously require a multilateral effort.

Where should the Code head next? States should consider whether to turn this code or a similar document into a binding convention. Before such a convention can take root, it makes sense to keep convincing more states to pledge to the practices within the revised Code. Along these lines, the international community needs to work toward bringing all

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[7] Ibid.

states, including non-member states of the IAEA, into the safety and security system represented by the Code of Conduct. Some fifty nations are not member states of the IAEA but still use radioactive sources for various applications, such as medicine, industry, and research. An appropriate role for the UN would be to pick up where the IAEA has little influence. That is, the UN should consider how to encourage more states to join the IAEA and to reach out to the remaining non-member states of the IAEA to help provide assistance to improve their regulatory controls of radioactive materials. Since 1995, the IAEA's Model Project has helped improve regulatory controls in more than eighty member states. A similar assistance effort should be extended to non-member states in need of such assistance.

Another recent international point of leverage is the G8 Global Partnership's strong interest in enhancing the security of radioactive sources. This effort could literally pay off as a funding mechanism to provide assistance to states in need.

Positively, the world community is taking seriously the threat of radiological attack and, as outlined above, has begun to put in place instruments to improve safety and security of radioactive materials. As discussed above, additional effort, however, is needed to make sure that all states and the public are prepared for a dirty bomb attack and that more states continue to enhance regulatory controls.