Deploying Nuclear Detection Systems

A Proposed Strategy for Combating Nuclear Terrorism

James Goodby, Timothy Coffey, and Cheryl Loeb

Center for Technology and National Security Policy

National Defense University

July 2007

James Goodby has been professionally involved with nuclear issues for 50 years. He served in ambassadorial assignments in the administrations of Presidents Carter, Reagan, and Clinton and was chief negotiator for Nunn-Lugar agreements with Russia, Ukraine, Kazakhstan and Belarus in 1993-1994. James Goodby is also a well-known author and scholar on nuclear weapons issues. His most recent book, *At the Borderline of Armageddon: How American Presidents Managed the Atom Bomb*, was published in June 2006.

Timothy Coffey holds the Edison Chair for Technology in the Center for Technology and National Security Policy. He is also a Senior Research Scientist at the University of Maryland. He was the Director of Research at the U.S. Naval Research Laboratory from 1982 to 2001. He has published extensively in the scientific literature and has served on numerous advisory panels. Dr. Coffey holds a BS (EE) from the Massachusetts Institute of Technology and a Ph.D. (Physics) from the University of Michigan.

Cheryl Loeb is a Research Associate at the Center for Technology and National Security Policy at the National Defense University and is also a Ph.D. candidate in the Biodefense Program at George Mason University. Ms. Loeb may be contacted via email at loebc@ndu.edu or by phone at (202) 685-2397.

Acknowledgements. The authors would like to acknowledge helpful criticism and suggestions from Spike Bowman, Linton Brooks, James Kurfess, Gary Phillips, Sam Musa, Kimberly Thachuk, and David York.

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Executive Summary

The most likely means of delivering a nuclear bomb on a major city is through a successful smuggling effort by a terrorist organization. The catastrophic damage it would cause demands cooperative action by all responsible governments. Several U.S. Government programs are in place to deal with this threat. They focus on:

- Measures to prevent access by terrorist groups to fissile material, particularly enriched uranium and plutonium, the basic fuel for nuclear bombs.
- Measures to strengthen international institutions to enable governments to deal more effectively with illicit trade in fissile materials and in equipment that can produce such materials.
- Measures to enhance international cooperation in intelligence sharing and law enforcement.
- Cooperative international defense activities designed to intercept illegal trafficking in fissile materials and equipment to produce these materials.
- Strengthening the capacity to monitor and detect illicit shipments of fissionable materials at entry points into the United States and, in cooperation with other countries, at key transportation nodes overseas.

This report focuses on the last of these programs, and primarily on deployment of sensors overseas. Our conclusion is that U.S. plans for deployment of various types of sensors overseas needs to be:

- better integrated with all the activities identified above,
- prioritized to focus on identified threats,
- configured to permit maximum flexibility and efficiency in the use of resources,
- based on the principle that lack of cooperation on the part of key partners will entail disadvantages for them,
- seen as part of a program designed to become a routine part of international law enforcement,
- closely tied to legislation under consideration or recently adopted in the U.S. Congress, and
- part of a global approach to nuclear nonproliferation in which international institutions assume a leading and sustained leadership role.

This report provides an overview of the threat from nuclear terrorism; discusses the role of intelligence and risk assessments in countering this threat; provides a brief overview of nuclear detection technologies and issues; briefly summarizes key U.S Government programs involved in nuclear detection; summarizes domestic legislation, which provides the impetus for increasing international collaboration; and discusses the need for a global approach to nuclear nonproliferation in which international institutions assume a leading and sustained leadership role.

Introduction

Preventing terrorist organizations from acquiring and using nuclear weapons and related materials is one of the most important challenges facing the international community today. Nuclear materials are still inadequately safeguarded in territories of the former Soviet Union and elsewhere around the world, and terrorist organizations have openly stated their desire to obtain and use these weapons in attacks against the United States. The catastrophic damage a nuclear terrorist attack would cause, and its international implications, demands cooperative action by all responsible governments.

Several U.S. Government programs are in place to deal with this threat, such as the Second Line of Defense Core Program, the Megaports Initiative, and the Container Security Initiative. In cooperation with other countries, these programs aim to strengthen our capacity to monitor and detect illicit shipments of nuclear and radiological materials at key transportation nodes overseas. While these programs have had success, the U.S response to the threat from nuclear smuggling and terrorism needs to be better coordinated, prioritized to focus on identified threats, configured to permit maximum flexibility and efficiency in the use of resources, and, most importantly, become part of a global approach to nuclear nonproliferation in which existing international institutions assume a leading and sustained leadership role.

We recognize that because different partners bring different priorities and constraints, a formal and informal coordinating mechanism with international organizations and other partners is important to nuclear detection. To encourage broad international participation, we recommend using an established international institution to spearhead and coordinate global nuclear detection and interdiction activities. These efforts will complement and coordinate existing activities and will not replace them. Such an organization could operate under Resolution 1540 of the United Nations Security Council, which encourages international cooperation in criminalizing the possession of nuclear materials and tightening controls over such materials. This organization would be dedicated to the identification, detection, and interdiction of illicit nuclear materials and will work closely with the international law enforcement and intelligence communities to ensure that nuclear detection becomes routine practice throughout the world. This will provide a means for exchanging technology, sharing intelligence, correcting flaws in the operation of the system, and encouraging best practices, with the end goal of rapid emplacement of sensors at key locations identified through intelligence collection and risk assessments. Emplacement would not be based on gross tonnage estimates but rather risk analyses.

The threat from nuclear terrorism necessitates a coordinated response from the United States and its international partners. An international culture of combating nuclear smuggling already exists that will facilitate the establishment of a coordinating body dedicated to the identification, detection, and interdiction of nuclear threats.

Understanding the Threat of Nuclear Terrorism

Since the terror attacks against the United States in September 2001 and the bombings in Bali, Madrid, and London, there has been a growing awareness of the increasing threat of nuclear terrorism. The possibility that al Qaeda or another terrorist organization might acquire the materials and the technical know-how to steal, buy, or build a crude nuclear weapon or radiological dispersal device brings the specter of nuclear terrorism to the forefront of U.S. national security policy.

In October 2003, a German cargo ship named BBC China was intercepted en route to Libya with the components for building approximately 10,000 P-2 gas centrifuges designed for enriching uranium to specifications required for a nuclear weapon.[1] This illicit shipment of centrifuges was part of an international nuclear materials smuggling ring headed up by Pakistani scientist Abdul Qadeer Khan. While the interdiction of the illegal components contributed to Libya's renunciation of a nuclear weapons program, both Iran and North Korea are known to have had extensive dealings with A.Q. Khan and are believed to have received numerous nuclear weapons components from his smuggling ring.

The capture and house arrest of A.Q. Khan have likely slowed down the international nuclear smuggling black market, but other unknown smuggling networks evidently exist. This type of nuclear proliferation presents a serious threat to international security. Among other considerations, North Korea and Iran continue to pursue nuclear weapons programs and will likely seek materials, components, and technical expertise from outside suppliers. Both countries have intensified their nuclear posturing, most notably in the form of an underground nuclear weapons test by North Korea on October 9, 2006. North Korean possession of nuclear weapons endangers security and stability in the region and increases the risk of nuclear terrorism. North Korea currently lacks an intercontinental ballistic missile (ICBM) capable of reaching the continental United States, so the more immediate threat to the United States stems from the possibility that North Korea might transfer nuclear weapons and related materials to terrorist organizations or other rogue states.

The International Atomic Energy Agency (IAEA) has reported a number of attempted thefts of weapons-useable and fissile material from nuclear sites, sometimes by employees of the facilities. A recent analysis of open source information by Sandia National Laboratories found roughly 750 incidents of trafficking in nuclear materials.[2] On January 25, 2007, for example, Georgian officials announced that they had arrested a

[1] Colonel Charles D. Lutes, "New Players on the Scene: A.Q. Khan and the Nuclear Black Market," *EJournal USA.* Available online at <http://usinfo.state.gov/journals/itps/0305/ijpe/lutes.htm>.
[2] David York, *National Security Issues in Science, Law, and Technology: Confronting Weapons of Terrorism* (Taylor & Francis, May 2007).

Russian man in 2006 after he had attempted to sell roughly 100 grams of highly enriched uranium (HEU) in Georgia.[3]

A number of known terrorist organizations have also expressed interest in—and taken steps toward—obtaining nuclear weapons and materials. The Japanese terror cult Aum Shinriyko reportedly had expressed interest in obtaining nuclear materials, and it is believed that al Qaeda has been interested in purchasing nuclear materials for over 10 years. Raids of al Qaeda safe houses, training camps, and other locations after the fall of the Taliban in 2001 resulted in the seizure of documents, training manuals, and computer discs with information related to the acquisition and development of nuclear weapons. Moreover, in August 2001, al Qaeda leader Osama bin Laden met with two officials from Pakistan's nuclear weapons program to discuss nuclear, chemical, and biological weapons.[4]

[3] Elena Sokova, William Potter, and Cristina Chuen, "Recent Weapons Grade Uranium Smuggling Case: Nuclear Materials are Still on the Loose," CNS Report, January 26, 2007, Center for Nonproliferation Studies, Washington, DC. Available online at <http://www.cns.miis.edu/pubs/week/070126.htm>.

[4] Kamran Khan and Molly Moore, "2 Nuclear Experts Briefed Bin Laden, Pakistanis Say," *Washington Post,* December 12, 2001.

Intelligence and Nuclear Materials Smuggling

There are numerous ways terrorists might smuggle nuclear and fissile materials into the United States. One of the most publicized ways involves transporting materials in containers. The world's seaports, for example, move an astounding 270 million TEUs[5] of containers annually, accounting for 90 percent of the world's cargo. In the United States, almost half of incoming trade (by value) arrives via ship.[6]

If smugglers or terrorists do not want to lose chain of custody over their illicit materials, it is likely that they would try to escort the material into the United States through an airport or remote border crossing, which poses a number of difficulties for Federal authorities. For example, many border crossings are not equipped with detection portals. While the Department of Homeland Security (DHS) is working to correct this situation, radiation portal monitors will not be placed at all border locations for a number of years.

There are, however, other opportunities to detect materials entering the United States. The Domestic Nuclear Detection Office (DNDO) is currently working with the U.S. Coast Guard to ensure that all boarding teams are equipped with radiation detection equipment by the end of this year. DNDO also has several initiatives underway, including the Securing the Cities (STC) program and the Southeast Transportation Corridor Pilot (SETCP), which seek to provide State and local operators with the ability detect and interdict materials within the United States.

U.S. Borders and Ports of Entry: High Traffic Zones

U.S. borders and ports are extremely high traffic zones. On an average day for U.S. Customs and Border Protection in FY2006, for example, officers processed:

- 1.1 million passengers and pedestrians
- 70,900 truck, rail and sea containers
- 240,737 incoming international air passengers
- 71,151 passengers/crew arriving by ship
- 327,042 incoming privately owned vehicles
- 85,300 shipments of goods approved for entry

Source: U.S. Customs and Border Protection, "On a Typical Day…," January 2007. Available online at: <http://www.cbp.gov/linkhandler/cgov/newsroom/ fact_sheets/typical_day.ctt/typical_day.pdf>.

[5] When container vessels were introduced in 1968, containers were 20 feet long. Since then, containers have doubled in length, giving rise to the term "twenty-foot equivalent unit."
[6] U.S. Customs and Border Protection, "Container Security Initiative, U.S. Customs and Border Protection Response to Terrorism." Available online at <http://www.cbp.gov/linkhandler/cgov/border_security/ international_activities/csi/csirev_1002.ctt/standard_current_generic_csi.ppt>.

Still, terrorists might ship their materials into the United States at a remote land or sea location that does not have a border post. Hence, we must act to interdict the materials before they reach the United States.

One likely method for terrorists to transport illicit materials internationally is through known smuggling routes and shipment lanes. Hundreds of trafficking rings operate throughout Europe, engaging in human trafficking, arms smuggling, cigarette smuggling, drug trafficking, international vehicle theft rings, hazardous waste dumping, and cross-border fraud schemes. These smuggling rings make a living through knowing which borders are easiest to cross, which routes are least patrolled, and which individuals can be bribed. Most are well-seasoned, highly sophisticated, criminal networks with good connections in and out of government and are less likely to get caught than are amateurs. "The great fear is that because these trafficking rings are not concerned with whom or what they are smuggling, but rather how much a client can pay, they may be helping al Qaeda and other groups to gain access to many European countries."[7]

Indeed, nuclear smuggling is not the disorganized trade of petty offenders that many people may imagine. In Russia, for example, "[s]mugglers are believed to collect and share information on which Russian customs posts are equipped with radiation monitors and to route their shipments accordingly."[8] Not only have smugglers beaten the system by testing radiation detection devices by sending decoys across borders, but they also have devised ingenious schemes for concealing illicit merchandise. These professional smugglers know the terrain and the authorities who are either corrupt or even complicit in the smuggling activities. Most smuggling routes have existed for generations and smugglers and traffickers will move whatever goods net them the most profit; most are unlikely to have moral or ethical qualms about trafficking in nuclear materials.[9]

We can maximize our current detection capabilities through strategically deploying appropriate detectors based on intelligence and risk assessments. Two key types of deployment of detectors would be:

Along identified smuggling routes and known shipment lanes. The majority of thefts involving trafficking in fissile material have occurred in the former Soviet states and Russia. The primary corridors of activity are through Georgia, Azerbaijan, Turkmenistan, Uzbekistan, and Kazakhstan into the middle-eastern states; and through Ukraine, Moldova, Romania, and Bulgaria, into Turkey. Multiple seizures of fissile material have taken place in Istanbul, Turkey, presumably because of its large seaport. A large majority of non-fissile nuclear material has taken this route. Analysis has also shown nuclear material trafficking from Krasnoyarsk, Russia, down into the South China Sea, and from

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[7] Kimberley Thachuk, "Countering Terrorism Across the Atlantic," *Defense Horizons 53*, July 2006, 4–5.
[8] Rensselaer Lee, "The Dark Side of the Nuclear Smuggling Business," Testimony to Subcommittee on Prevention of Nuclear and Biological Attack, House Committee on Homeland Security, September 22, 2005.
[9] Interview with Dr. Kimberly Thachuk, Center for Technology and National Security Policy, May 15, 2007.

former Soviet states into Africa (primarily South Africa) and South America (primarily Brazil, Venezuela, and Argentina).[10]

Most seizures along these identified routes involve amateur smugglers with relatively small amounts of material. In some cases, small quantities of high-grade material have been seized, which usually indicates a major trafficker providing a small sample of a much larger supply to a potential customer for testing. There are very few cases involving large shipments of material, as these incidents involve international criminal organizations or nation-states, both with the resources to conduct counterintelligence and counter-surveillance operations.[11]

Airports, borders, and ports in countries identified as having nuclear materials where theft has occurred or where facilities are least secure. Such locations include Russia and former Soviet States, such as Georgia and Uzbekistan.

Intelligence organizations around the world will have to cooperate to achieve the quickest possible sharing of information and resources if we are to interdict nuclear materials before they reach their intended destination. Agencies involved in counter-terrorism intelligence, as well as those specializing in smuggling and interdiction operations will need to freely share information. An international coordinating body, operating under UNSCR 1540, would provide the platform for closer collaboration among law enforcement and intelligence organizations and the management of international nuclear detection activities.

Fortunately, many police and law enforcement agencies, as well as international organizations like Interpol and the United Nations Office of Drugs and Crime, already provide a platform for information sharing. One good example of effective multilateral cooperation is the Proliferation Security Initiative (PSI). Countries participating in PSI agreements and exercises help build relationships and operational cooperation and provide information aimed at improving targeted interdiction, cooperation, and intelligence sharing**.** Law enforcement agencies around the world generally have longstanding working relationships in the area of combating organized criminal activity and are able to cooperate closely and quickly on the interdiction and apprehension of smugglers and traffickers. "Indeed, [prior to September 11] transatlantic law enforcement collaboration already had ironed out any barriers to concluding agreements on evidence sharing, cooperation in law enforcement, intelligence gathering, rendition of fugitives, joint training, harmonized standards, port security, and financial regulation."[12]

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[10] Material provided by David L. York, International Security and Technical Systems Analyst, Sandia National Laboratories, February 1, 2007. His work was reported in *Science Daily*, available online at <http://www.sciencedaily.com/upi/index.php?feed=Science&article=UPI-1-20070117-16023600-bc-us-monitor.xml>.
[11] Ibid.
[12] Jonathon M. Winer, "Cops across Borders: The Evolution of Transatlantic Law Enforcement and Judicial Co-operation," Council on Foreign Relations, September 1, 2004. Available online at <http://www.cfr.org/publication/7389/cops_across_borders.html>. Cited in Kimberley Thachuk, "Countering Terrorism Across the Atlantic," *Defense Horizons 53*, July 2006, 4–5.

Nuclear Detection Systems and Issues

The difficulty of detecting nuclear materials has been known since the beginning of the nuclear age. Over the years, considerable effort has been put into defining what nuclear materials detection systems should consist of, and long-term research is under way to identify and develop new technologies. However, mature detection technologies exist that can be deployed in large quantities over the next 10–15 years. Indeed, the technologies that are viable for relatively near-term deployment under the ASP program are based on this past work. They generally employ passive detection techniques—detection of gamma rays and neutrons—and are discussed in many open literature articles.[13]

Plastic Scintillation Detectors

The most likely technologies for gamma ray detection are plastic scintillation detectors, sodium iodide scintillation detectors, and cooled, high-purity, germanium, solid-state detectors. Other detection technologies that use materials such as lanthanum bromide and cadmium-zinc-telluride have made significant progress and have some advantages, and procurement of handheld detectors is expected to begin next year. However, it is unlikely that they will see wide deployment in the near term. All of these detectors operate by providing a gamma radiation count as a function of gamma radiation energy received. Most gamma radiation of interest occurs at very precise energies that are determined by the energy-level structure of the parent isotope. The more precisely one can measure the gamma radiation energy the better one can identify the source of the radiation. This is referred to as the *energy resolution* of the detector.[14] The three detection technologies mentioned above have different energy resolutions. The cost of the detectors generally increases as the energy resolution increases.

In general, plastic scintillation detectors do not have the energy resolution necessary to identify the material that is responsible for the detected radiation. They are, however, relatively inexpensive and available with large surface areas. For example, a plastic scintillation detector 2 inches thick with a surface area of 9 square feet will cost about $3,000. Because one is not seeking fine energy resolution with these detectors, the electronics and software that enable the detection process is simplified. Therefore, one

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[13] An introduction to these detection technologies can be found in Gary W. Philips, David J. Nagel, and Timothy Coffey, "A Primer on the Detection of Nuclear and Radiological Weapons," *Defense and Technology Paper 13* (Washington, DC: Center for Technology and National Security Policy, May 2005). Available online at <http://www.ndu.edu/ctnsp/Def_Tech/DTP%2013%20Primer%20on%20Detection.pdf>. A discussion of nuclear weapons detection can be found in "Detecting Nuclear Warheads," Steve Fetter, et al., "Detecting Nuclear Warheads," *Science and Global Security*, 1990, Vol. 1, 225–302. Available online at <http://www.princeton.edu/~globsec/publications/pdf/1_3-4FetterB.pdf>. A discussion of this topic within the context of terrorism and port and border security can be found in "An overview of non-traditional nuclear threats" by Geelhood and Wogman, *Journal of Radio Analytical and Nuclear Chemistry*, Vol. 263, No. 1 (2004) 267–273.

[14] A discussion of this matter can be found in "White Paper: Why High-Purity Geranium (HPGe) Radiation Detection Technology is Superior to Other Detector Technologies for Isotope Identification." Available online at <http://www.ortec-online.com/papers/sup_hpge.pdf>.

gets significantly more detector area per dollar from plastic scintillation detectors than from most other detectors.

Since detector sensitivity increases approximately as the square root of the surface area, plastic detectors are potentially useful in portal applications, where large areas are desired and are available. Because of their relatively low cost and large surface area, plastic detectors might provide better sensitivity at lower cost than other gamma radiation detectors (if increased count rate is all one is looking for). Low cost makes plastic scintillation detectors potentially useful as a primary radiation alarm in container screening applications. However, since they do not have the energy resolution to allow unambiguous identification of the radiating species, they are prone to high false alarm rates. This is a serious problem in high-throughput applications.

Sodium Iodide Detectors

The matter of radiating species identification is somewhat improved with sodium iodide detectors, which have higher spectral resolution. Sodium iodide detectors can be manufactured in a wide variety of sizes. Historically, a standard sodium iodide detection crystal used for many applications was 3 inches in diameter by 3 inches thick and weighed about 3 pounds. The addition of a voltage converter and a photomultiplier tube adds about 1 pound. The cost of the basic assembled detector (not including the multi-channel analyzer, software, and readout device) is about $1,000–$1,500. A portable detector requires a multi-channel analyzer to obtain energy resolution, software to analyze the data, memory, and a display. These bring the total price for a single portable unit to about $10,000 and the weight to about 8 pounds. For portal monitors and other SNM applications, sodium iodide detectors 2″x4″x16″ are also widely utilized, as are sodium iodide detectors that are 4″x4″x16″. The larger area provides significantly improved sensitivity relative to the 3″x3″ detectors. These detectors have an energy resolution of about seven percent at 662 kev and five percent at 1332 kev. This energy resolution would have difficulty distinguishing between closely spaced lines. Nevertheless, it is adequate to eliminate many radiation sources that are not of concern but could lead to high false positive alarm rates if not eliminated.

A sodium iodide portal detection system would likely involve an array of the basic detection units, such as those discussed above. The multi-channel analyzer, software, etc. can be common for an array of detectors, so the cost of such a system should scale roughly with the number of detection elements in the array, plus the cost of the supporting hardware and software. The number of detection elements would be related to the required minimum detection level. These detectors can get large very rapidly for the detection of weak signals in a noisy environment, which is often the situation in the detection of nuclear materials. Therefore, the use of sodium iodide detectors as primary screeners in a portal application will be much more expensive than using plastic scintillators. The tradeoff to be made here is between increased cost but improved identification capability (using sodium iodide) and lower cost and higher sensitivity but increased false alarms (using plastic).

Cooled, High-Purity, Germanium Detectors

The "gold standard" of passive gamma radiation detectors is the cooled, high-purity germanium detector, which has an energy resolution of 0.2-0.3 percent at 662 kev. This should be compared to seven percent for sodium iodide and no energy resolution for plastic detectors. Unlike plastic or sodium iodide detectors, the germanium detectors provide precise determination of peak energies, separation of closely spaced peaks, and detection of weak peaks in the presence of a strong gamma radiation background. These attributes enable the identification of the detected radiation source, given sufficiently strong signals and sufficient integration time. The price for this capability is that the detector must be cooled to the temperature of liquid nitrogen. Therefore, a dewar of liquid nitrogen or a mechanical refrigerator must be incorporated into the germanium detector. A complete germanium portable detector (full liquid nitrogen dewar or mechanical cooler, 7.5-cm-diameter, 5-cm-thick germanium crystal, multi-channel analyzer, software, and laptop) will weigh about 25 pounds and cost in excess of $50,000. Arrays of germanium detectors can also be constructed. For example, ORTEC offers freight cargo monitoring systems consisting of 8.5 cm diameter by 3 cm thick detectors where 2–6 detectors are incorporated into a module and up to 12 modules constitute a sensor panel.[15] The cost, complexity, and weight of germanium detectors suggest their employment as portable devices at the secondary or tertiary inspection levels rather than as arrays at the primary detection level. The deployment of large numbers of germanium detector arrays at ports and border crossings would likely be prohibitively expensive. Their use, therefore, would be restricted to limited numbers for special applications.

When comparing gamma-ray detectors, it is important to note that the costs of maintenance increases substantially when going from the lowest-resolution detector (plastic) to the better-resolution detector (sodium iodide) and especially to the highest-resolution detector (germanium). Similarly, the education level and training required for the operators/users of the equipment increases with the detector capability. Furthermore, while the analysis of the spectral data can be automated, it is still advisable to have a trained analyst look at the data in case of a secondary or tertiary alarm. The trained analyst would not necessarily have to be on site, as the data could be transmitted electronically to the analyst's location

Neutron Detectors

The most common neutron detectors are gas-filled, proportional counters. These consist of a sealed tube containing boron fluoride gas or a gas of the helium isotope ^{3}He. They detect thermal (low-energy) neutrons. The fission neutrons of interest are in the MeV range and must be thermalized (slowed down) for the proportional counters to work. This is done by surrounding the gas-filled tubes with a neutron-moderating material, such as polyethylene. Tubes filled with ^{3}He gas are the most commonly used thermal neutron detector. These tubes are insensitive to the gamma radiation that will likely be present. A pressurized ^{3}He filled tube suitable for portal screening might be 2 inches in diameter by 72 inches long, weigh about 3 pounds, and cost about $3,000. A lower-sensitivity tube

[15] ORTEC, "Intelligent, Modular Solutions to Portal Monitoring System Needs for Illicit Nuclear and Radiological Material Interdiction." Available online at <http://www.ortec-online.com/pdf/asp-truck.pdf>.

suitable for portable neutron detectors might be 1 inch in diameter by 3 inches long, weigh about 5 ounces, and cost about $400.

A second type of readily available neutron detector consists of a high neutron capture isotope, such as lithium-6 (^{6}Li), doped into scintillating plastic or glass fibers. These are solid-state alternatives or complements to the ^{3}He detectors. These detectors can be made in any size or shape. A 15″x10″x20″ detector will weigh about 20 pounds and cost about $7,000. A 50″x48″x11.5″ detector will weigh about 450 pounds and cost about $20,000. These detectors have a sensitivity to gamma radiation that can cause false neutron detection in certain, well-known circumstances. An interesting new entry into the neutron detection field is the "bubble" detector developed by Bubble Technology Industries. The basic detection element consists of a gel containing tiny droplets of superheated liquid. When a neutron strikes a droplet, the droplet vaporizes forming a visible bubble. The number of bubbles is related to the neutron exposure. This technology is potentially cheaper and lighter than the gas-filled proportional counters or the doped fibers.

The technologies discussed above are mature and well understood, so comparing the expected performance and costs for various technology combinations employed in various situations is straightforward. Indeed, so much is known about the technologies that much of the expected performance and cost comparisons can be done by computer simulation. To conduct such simulations, it is necessary to specify the required minimum detectable gamma ray spectral flux, the required minimum detectable neutron flux, the background radiation, the level of acceptable false positives, the level of acceptable false negatives, and the maximum time available for detection. This information should allow the design of a gamma radiation and/or neutron detection system for any specified situation. Verification of the actual performance would, of course, require an extensive data collection program in the environments in which the detectors are to be deployed. The outcome of such data collection efforts would be the receiver operation characteristic curves (ROC curves) that quantify the effectiveness of the detectors by providing the detailed statistics regarding false positive and false negative detections for the specific environments in which the detectors will be used.

Detection Issues

The detection technologies discussed above are well understood and, within limits, detection systems based on them can be (and are) designed and built. However, questions remain regarding whether those limits are compatible with realistic threats. A determined smuggler probably will be well versed in the limitations of the various detection technologies and will act to exploit them. Wrapping HEU with lead, for example, would make detection by handheld devices difficult, and embedding the HEU-lead package in a shipment of high-Z material would make radiographic identification challenging. The use of imaging detectors, such as coded-apertures or Compton imaging, would provide a significant advantage for detection of ^{232}U in weapons, as the radiation from the weapon will be concentrated in a small portion of the image, while the background will be spread over the entire image. However, it should also be noted that the inspection time needed to build up a useful image with these systems is considerably greater than for a non-imaging detector.

Another avenue a smuggler might take would be to suspend the contraband SNM in the center of a liquid transport ship, such as a large oil tanker. An oil tanker might carry 250,000 cubic meters of oil, which corresponds to a volume 300 meters long, 30 meter wide and 28 meters deep. If the SNM were properly placed within such a large volume of oil, gamma rays and neutrons would be undetectable. The use of radiography to detect the SNM mass also is not promising in this scenario.

The purpose of these two simple examples is to make the point that there are many avenues available to a determined smuggler. It is, therefore, unrealistic to depend solely on the current level of routine detection. While some degree of routine detection is desirable, there should be in place a system that is targeted against specific threats known to be originating in identified parts of the world. Such a system could be provided through an international coordinating body operating under UNSCR 1540. It would allow those responsible for detection to tailor the approach to the specific threat. The approach would take into account known techniques for concealing the presence of the contraband being smuggled. This would allow detection means to be utilized that are not routinely used because of expense or because of safety issues. An example of the latter is certain active interrogation techniques that employ radiation levels that might be too high for routine use but would be acceptable in special cases. Another example is the use of coded aperture imaging detectors or Compton imaging detectors (to improve the signal-to-noise ratio) that would be too expensive to deploy broadly on a routine basis.

Current Nuclear Detection Programs

Several U.S. Government agencies participate in programs to detect and interdict illicit trafficking in nuclear materials. The Departments of State, Homeland Security, Defense, and Energy have provided radiation detection equipment to countries around the world through detection related programs, including the Second Line of Defense Core Program, the Megaports Initiative, and the Container Security Initiative.[16]

A recent upswing in funding for these organizations and growing Congressional interest in nuclear detection necessitate a more coordinated approach. Using UNSCR 1540 as a spearhead to coordinate activities would allow more rapid deployment of devices for detecting nuclear materials at domestic and foreign air, land, and sea transit points and would mitigate the duplication of resources and materials.

The Department of Energy's National Nuclear Security Administration (NNSA) runs the Office of Second Line Defense, which is organized into two key initiatives: the Core Program (SLD-Core) and the Megaports Initiative.

SLD-Core Program

The SLD-Core Program was initially created to assist Russia in its efforts to safeguard against nuclear and fissile materials smuggling and trafficking. The U.S. officially began working with the Russian Customs Service in 1998 in an effort to equip Russian border crossings, airports, and other strategic feeder ports with handheld and fixed radiation detection equipment and the specialized training required to use the detectors. Since it began working with the Russian Customs Service in 1998, the SLD-Core program has equipped 88 sites with detection related technologies.[17] To ramp up nuclear detection activities in Russia, DOE recently announced that the United States and Russia have agreed to emplace radiation detection monitors at all of Russia's 350 international border crossings by 2011, which is 6 years earlier than originally planned.[18]

The NNSA SLD-Core program has expanded its focus since 1998 and has installed monitoring equipment in Former Soviet Union (FSU) states and Greece and is currently working with countries in Eastern Europe and the Caucasus, Baltic, and Mediterranean regions. The SLD-Core program is also responsible for the repair and upkeep of radiation

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[16] There are numerous Government programs engaged in nuclear detection activities. Due to space constraints, not all could be discussed in depth. Other key programs include: DOE's Cooperative Radiological Instrument Transfer Project (CRITr), the State Department's Export Control and Related Border Security (EXBS) Assistance Program, DOD's Weapons of Mass Destruction-Proliferation Prevention Initiative (WMD-PPI), and DOD's International Counterproliferation (ICP) Program.

[17] NNSA, "NNSA's Second Line of Defense Program." Available online at <http://www.nnsa.doe.gov/docs/factsheets/2006/NA-06-FS01.pdf>.

[18] John J. Fialka, "Russia, U.S. Step Up Nuclear-Control Drive," *Wall Street Journal*, June 1, 2007. Available online at <http://online.wsj.com/article/SB118066679818221102.html?mod=todays_europe_page_one>.

detection equipment installed by other U.S. Government agencies at the end of the Cold War.[19]

Megaports Initiative

The Department of Energy's NNSA initiated its Megaports Initiative in 2003 with the aim of working with designated partner countries to equip large international seaports with radiation detection equipment to detect, deter, and interdict nuclear materials. The three main goals of the Megaports Initiative are to deter terrorists from using the world's seaports to ship illicit materials, detect nuclear or radioactive materials if they are shipped via sea cargo, and interdict harmful material before it is used against the United States and its allies.[20]

Under the Megaports Initiative, which is coordinated closely with the Container Security Initiative (led by DHS), foreign customs and other officials are provided with radiation detection equipment and training to screen shipping containers entering and departing their ports. Key to the success of the Initiative is that Megaports systems are specifically designed to have minimal impact on port operations. The Megaports Initiative is currently operational in Greece, the Bahamas, Sri Lanka, the Netherlands, Singapore, and Spain, and NNSA personnel are at various stages of implementing the Megaports program in 13 other countries: Belgium, China, Dubai, Egypt, Honduras, Jamaica, Israel, Oman, the Philippines, the Dominican Republic, Thailand, and Taiwan. NNSA is engaged in negotiations with approximately 20 additional countries.[21]

Container Security Initiative

In response to the terror attacks against the United States on September 11, 2001, and the increasing awareness of the potential threat from nuclear and radiological terrorism, the U.S. Customs and Border Protection (CBP) initiated the Container Security Initiative (CSI) on January 17, 2002. The three strategic goals of the CSI are to:

- Secure U.S. borders against terrorists and weapons by evaluating all containers bound for the United States for terrorist risk before lading at CSI ports.
- Build a robust CSI cargo system that will withstand a terrorist incident and ensure a continuous flow of trade or prompt resumption of trade through CSI ports in the event of a terrorist incident.
- Protect and facilitate legitimate trade by maintaining effectively operating CSI ports, working with host nations to inspect all containers identified as a possible

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[19] NNSA, "SLD Implementation Strategy: Revision B," April 2006. Available online at <http://www.doeal.gov/dicce/ImplementationDocs/SLDImplentationStrategy.pdf#search=%22SLD-Core%20program%22>.

[20] NNSA, "Megaports Initiative." Available online at <http://www.nnsa.doe.gov/megaports_initiative.htm>.

[21] NNSA, "Second Line of Defense Program." Available online at <http://www.nnsa.doe.gov/na-20/sld.shtml>.

terrorist risk, and providing benefits and incentives to international governments and organizations, as well as U.S. trading partners.[22]

As of August 2006, 44 foreign ports were actively participating in the CSI; by the end of FY2007, CBP plans to cover 85 percent of containers destined for the United States from CSI monitored ports and to maintain a 100 percent manifest review rate of those ports.[23] Along with its activities in the CSI, CBP also uses nuclear detectors at U.S. ports-of-entry to monitor and interdict nuclear and radiological materials.

Domestic Nuclear Detection Office

DHS participates in nuclear detection programs through its Domestic Nuclear Detection Office (DNDO). Established in April 2005, DNDO is the only Federal organization dedicated to nuclear detection and the development of a nuclear detection architecture aimed at improving our capability to detect and report unauthorized attempts to import, possess, store, develop, or transport nuclear or radiological material for use against the United States.[24] DNDO, which is staffed by representatives from Federal departments and agencies, conducts both near-term and long-term research and development of detection architecture. The architecture, as developed, consists of three high-level geographic layers: domestic, border, and international.

In 2006, DNDO announced the award of contracts totaling up to $1.15 billion for the Advanced Spectroscopic Portal (ASP) program to enhance the detection of radiological and nuclear materials at the nation’s ports of entry. The program focuses on developing detectors that will be able to discriminate between naturally occurring radioactive materials and true threat materials.

ASP models were deployed to the Nevada Test Site, where they will be tested using nuclear threat material. Portals have also been delivered to the New York Container Terminal for data collection, and DNDO plans to deploy radiation portal monitors at the Port of Tacoma for testing.[25] Further, in the FY2008 Homeland Security spending bill (HR 2638), the President has requested $9.8 million from the House and $9.6 million from the Senate for “red teaming” programs in DNDO.[26]

Some experts have questioned the expense of the portal technology adopted by DNDO, raising concerns about the efficacy of using such portals internationally. Recently,

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[22] U.S. Customs and Border Protection, “Container Security Initiative: 2006-2011 Strategic Plan.” Available online at <http://www.cbp.gov/linkhandler/cgov/border_security/international_activities/csi/csi_strategic_plan.ctt/csi_strategic_plan.pdf>.
[23] Ibid.
[24] Department of Homeland Security, “Domestic Nuclear Detection Office.” Available online at <http://www.dhs.gov/xabout/structure/editorial_0766.shtm >.
[25] Department of Homeland Security, “Fact Sheet: Select Homeland Security Accomplishments for 2006,” December 29, 2006. Available online at <http://www.dhs.gov/xnews/releases/pr_1167404984182.shtm>.
[26] Eileen Sullivan, “Appropriators Show Support for DHS’ ‘Red Team’ Scenarios,” *CQ Homeland Security*, June 13, 2007. Available online at <http://public.cq.com/docs/hs/hsnews110-000002531281.html>.

concerns also have been raised by the Government Accountability Office as to the detection rates of the machines. The authors of this report acknowledge the concerns about the detectors and recommend a thorough evaluation of the existing technologies. The red team effort should be helpful in this regard. DNDO has stated that it will continue performance testing of the machines.

Another significant effort that DNDO has underway is in the area of nuclear forensics. The DNDO's National Technical Nuclear Forensics Center (NTNFC) has two core missions—to develop and advance capabilities to perform nuclear forensics on pre-detonation nuclear and radiological materials, and to implement national-level integration, centralized planning, exercising and assessment across the full spectrum of Government nuclear forensics capabilities, from pre- to post-detonation. The nuclear forensics mission underpins the attribution process, contributing to deterrence of an initial attack, preventing a follow-on attack, and supporting prosecution and national response deliberations.

Secure Freight Initiative

On December 7, 2006, the Departments of Homeland Security and Energy announced a new initiative called the Secure Freight Initiative, a collaborative program aimed at deploying a globally integrated network of radiation detection and container imaging equipment to seaports worldwide.[27] The initial phase of the new program involves deploying nuclear detection technologies to participating ports in Honduras, South Korea, Pakistan, Oman, the United Kingdom, and Singapore. Beginning in early 2007, containers at the participating ports will be scanned for radiation and evaluated on risk factors before they are cleared for shipment to the United States and other international locations. If radiation is detected, an alarm will sound, simultaneously alerting homeland security officials and security personnel in the participating country. Data gathered on the containers will be combined with other intelligence and risk assessment data and shared among partnering countries to improve analysis of high-risk containers.[28]

The recent collaboration between the Departments of Homeland Security and Energy and the combination of intelligence and risk assessment in government-to-government information sharing are key components in the defense against nuclear terrorism. However, while progress is being made through the joint program, the legislatively mandated but unrealistic goal of one-hundred-percent coverage, coupled with little coordination among other U.S. programs, likely will diminish their effectiveness.

Current U.S. programs to combat international illicit trafficking of nuclear material have focused on installing portal monitors or conducting checkpoints along seaports and major highways, usually selecting locations based on gross tonnage of cargo. While this has led to several seizures of nuclear and radiological materials, deployments of nuclear detection technologies in this fashion focus primarily on areas subject to extensive commercial and industrial activity. It has been shown that in seaports having advanced

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[27] Department of Homeland Security, "Secure Freight Initiative: Vision and Operations Overview," December 7, 2006. Available online at <http://www.dhs.gov/xnews/releases/pr_1165943729650.shtm>.
[28] Ibid.

portal monitoring equipment, only 10–20 percent of the cargo is scanned for nuclear or radiological material due to the massive amounts of shipments traveling through these major ports.[29]

Our detection capabilities can be improved, however, by coordinating international activity through an established institution to spearhead and coordinate global nuclear detection and interdiction activities. Such an organization could operate under UNSCR 1540, which would provide a means for exchanging technology, sharing intelligence, correcting flaws in the operation of the system, and encouraging best practices, with the end goal of rapid emplacement of sensors at key locations identified through intelligence collection and risk assessment. Emplacement would be based not on gross tonnage estimates but on threat analyses. Such locations would include, for example, land, air, and sea ports and other locations along known smuggling routes and shipment lanes. A recent State Department initiative can provide lessons on how to collaborate internationally.

Nuclear Smuggling Outreach Initiative

One of the programs the State Department has developed to address the issue of nuclear smuggling is the Nuclear Smuggling Outreach Initiative, which is aimed at identifying and addressing shortcomings and gaps in nuclear smuggling security capabilities of states at risk.[30] The Initiative conducts outreach both to countries with source material and those at risk from nuclear smuggling activity.

After selecting at-risk countries based on assessments of their capabilities to prevent, detect, and prosecute illicit trafficking in nuclear and radiological material, an interagency team engages with host-government officials to develop a list of priority projects designed to close the capability gaps. Once they reach agreement on a list of projects, they work with potential donors in the international community, such as members of the G-8 Global Partnership, to arrange funding for them.[31] Despite limited funding, the Nuclear Smuggling Outreach Initiative has had strong interagency participation and support from international donor countries and can provide key lessons on how to collaborate in the international arena in nuclear detection.

International Counterproliferation Initiatives

The United States is an active participant in a number of international counterproliferation initiatives, including the Nuclear Terrorism Convention, the Global Initiative to Combat Nuclear Terrorism, the Proliferation Security Initiative, the G-8 Partnership Against the Spread of Weapons of Mass Destruction, the IAEA Additional

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[29] Material provided by David L. York, International Security and Technical Systems Analyst, Sandia National Laboratories, February 1, 2007. His work was reported in *Science Daily*, available online at <http://www.sciencedaily.com/upi/index.php?feed=Science&article=UPI-1-20070117-16023600-bc-us-monitor.xml>.

[30] U.S. Department of State, “Enlisting Foreign Cooperation in U.S. Efforts to Prevent Nuclear Smuggling,” May 25, 2006, Statement of Francis C. Record, Acting Assistant Secretary, International Security and Nonproliferation, before the House Committee on Homeland Security, Subcommittee on Prevention of Nuclear and Biological Attacks. Available online at <http://www.state.gov/t/isn/rls/rm/69307.htm>.

[31] Ibid.

Protocol, and the Global Threat Reduction Initiative. In particular, the Proliferation Security Initiative and the Global Initiative to Combat Nuclear Terrorism play a significant role in U.S. international cooperation related to nuclear detection and interdiction. The PSI is a broad international partnership of over 80 countries that coordinate their actions to interdict shipments of weapons of mass destruction (WMD) and their delivery systems and related technologies and materials.[32] PSI participants have engaged in numerous air, land, and sea interdiction training exercises.

On July 15, 2006, U.S. President Bush and Russian President Putin, recognizing that nuclear terrorism is one of the most dangerous international security challenges that the international community faces, announced the creation of the Global Initiative to Combat Nuclear Terrorism. President Bush stated that the Initiative reflected his intention to take the steps necessary to prevent the acquisition, transport, or use by terrorists of nuclear materials and radioactive substances. Among the key objectives of the Initiative is the establishment of a robust international detection architecture. Currently, over 50 countries have joined the Initiative.

These international efforts reflect a sense of urgency in dealing with the threat of nuclear terrorism and provide impetus for international collaboration in nuclear detection and interdiction. Further, the PSI and other multilateral initiatives could provide important contributions to improving targeted interdiction, cooperation, and intelligence sharing.

[32] The White House, "Statement on Proliferation Security Initiative," September 4, 2003. Available online at <http://www.whitehouse.gov/news/releases/2003/09/20030904-10.html>.

Detection Legislation

The case for a more strategic deployment of detectors to monitor goods bound for U.S. destinations and for close international collaboration is strong. This has been recognized in two important bills recently passed into law that demonstrate the interest of Congress and its recognition of the urgency of combating the threat. As of the time of writing, a third bill that addresses nuclear smuggling had emerged from conference.

The first bill, sponsored by Senators Richard Lugar (R-IN) and Barrack Obama (D-IL), was introduced November 1, 2005, as the "Cooperative Proliferation Detection and Interdiction Assistance and Conventional Threat Reduction Act." The Bill was reintroduced as S. 2566 in February 2006 and was signed into law January 11, 2007. The Lugar-Obama bill will launch a new nonproliferation initiative by focusing on two key issue areas: the threat from unsecured conventional weapons and the interdiction of weapons of mass destruction.

The Lugar-Obama legislation is aimed at providing incentives for other countries to cooperate with the United States in improving the monitoring of shipments to the United States. Specifically, the bill would increase statutory oversight on U.S. assistance to friendly foreign countries for proliferation detection and interdiction activities. The bill includes the provision that no less than one quarter of Chapter 9 funds (Foreign Assistance Act of 1961) be used for providing assistance to partner nations for the purpose of enhancing their capabilities to detect and interdict proliferation-related shipments by land, air, and sea.[33] The provision of funding to assist partners in nuclear detection and interdiction programs will be a key component of the implementation of UNSCR 1540 and an international coordinating body for nuclear detection.

The second bill, enacted as Public Law 109-347 on October 13, 2006, is also known as the "Security and Accountability For Every Port Act" and was sponsored by Rep. Daniel Lundgren (R-CA) and Rep. Jane Harman (D-CA). The bill sets standards for monitoring at domestic and foreign ports for nuclear and radiological materials. Some of the key provisions of the bill are risk-based funding through a dedicated Port Security Grant Program for U.S. ports and the authorization of the Secretary of Homeland Security to loan detection equipment and provide training in the operation of the detection portals to participating foreign nations.[34] The legislation also authorizes $2 billion over 5 years to increase security at U.S. ports, requires tightened access at ports, and requires the largest 22 ports to install radiation detection equipment by the end of 2007.

While the bill is focused almost wholly on domestic port security, it does require the Secretary of Homeland Security to conduct a study on the security and trade of U.S. land

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[33] United States Senate, "S. 2566, To Provide for Coordination of Proliferation Interdiction Activities and Conventional Arms Disarmament, and for Other Purposes." Available online at <http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_bills&docid=f:s2566rs.txt.pdf>.
[34] House Committee on Homeland Security, "Fact Sheet: The SAFE Port Act of 2006." Available online at <http://homelandsecurity.house.gov/SAFE_Port_Act_FactSheet_031206.pdf>.

ports and devise a strategic plan to enhance the security of the international supply chain. These new bills reflect a sense of urgency in Congress about dealing with the threat of nuclear smuggling and provide the domestic impetus for developing and implementing a global strategy. Action undertaken by the U.S. Government must reflect this urgency and use the momentum provided by these bills and current domestic and international nuclear nonproliferation activities to implement a program that is prioritized to focus on identified threats, configured to permit maximum flexibility and efficiency in the use of resources, and undertaken as part of a global approach to nuclear nonproliferation in which international institutions assume a leading and sustained leadership role.

The third bill is based on the work of The National Commission on Terrorist Attacks Upon the United States, more commonly known as the 9/11 Commission. In 2004, the 9/11 Commission submitted 41 recommendations to the Administration and Congress on improving homeland security, preventing terrorists from acquiring WMD, and developing strategies for preventing the spread of Islamic terrorism. In response to the Commission's recommendations, Rep. Bennie Thompson (D-MS) sponsored H.R.1, the "Implementing the 9/11 Commission Recommendations Act of 2007." Among other provisions, the legislation requires that within the next 5 years all container ships be scanned for nuclear devices before they leave a foreign port. In late July 2007, it was announced that differences had been resolved in Conference and H.R.1 would be sent to President Bush for signature.

Implementing an International Infrastructure

Nuclear smuggling and nuclear terrorism are not a temporary threat but one that will confront the world indefinitely, just as do other forms of smuggling and terrorism. The ad hoc approaches that have characterized efforts to cope with this threat are no longer adequate. Nuclear science, technology, and materials are no longer the province of a few select states. At least 60 nations host nuclear research and technology centers, and 144 nations are members of the International Atomic Energy Agency (IAEA). Access to nuclear materials—and technical competence with respect to those materials—is worldwide. While this situation is the source of the threat, it also provides means to deal with the threat.

Recognizing the need for international cooperation, the United Nations Security Council, in UNSCR 1540, noted that the Security Council is "Gravely concerned by the threat of illicit trafficking in nuclear, chemical or biological weapons and their means of delivery, and related materials, which adds a new dimension to the issue of proliferation of such weapons and also poses a threat to international peace and security." UNSCR 1540, among other things, "Decides also that all states shall . . . Develop and maintain appropriate effective border controls and law enforcement efforts to detect, deter, prevent and combat, including through international cooperation when necessary, the illicit trafficking and brokering in such items in accordance with their national legal authorities and legislation and consistent with international law." UNSCR 1540 also "Recognizes that some states may require assistance in implementing the provisions of this resolution within their territories and invites states in a position to do so to offer assistance as appropriate in response to specific requests to the states lacking the legal and regulatory infrastructure, implementation experience and/or resources for fulfilling the above provisions."[35]

To encourage broad international participation, we recommend using an established international institution to spearhead and coordinate global nuclear detection and interdiction activities. Such an organization could operate under UNSCR 1540. It would provide a means for exchanging technology, sharing intelligence, correcting flaws in the operation of the system, and encouraging best practices, sharing of resources, and expert training, with the end goal of rapid emplacement of sensors at key locations identified through intelligence collection and risk assessment. This effort would complement and coordinate existing nuclear detection activities, not replace them.

Nuclear smuggling and terrorism, like other forms of contraband smuggling and terrorism, are first and foremost law enforcement problems. The national and international infrastructures of law enforcement must be systematically brought to bear on this problem. Some progress has been made in mobilizing the international law enforcement community. For example, Interpol now issues Interpol International Notices

[35] United Nations, "Resolution 1540 (2004)," April 28, 2004. Available online at <http://www.state.gov/t/isn/73519.htm>.

to warn police, public entities, and other international organizations about potential threats from disguised weapons, parcel bombs, and other dangerous materials. Also, at the request of the UNSC, an Interpol-United Nations Special Notice was created to support the UNSC in the fight against terrorism. These suggest the beginnings of the needed international program. However, special action is required with respect to the problem of nuclear smuggling and terrorism. This is not only because of the great destructive power of nuclear weapons, but also because of the special technologies and expertise needed to address the problem.

Traditional law enforcement agencies are unable to deal with the nuclear smuggling and the terrorism problem. They must have available to them capabilities to do routine monitoring to detect nuclear smuggling and rapid access to special expertise and equipment to respond to identified special threats. They also need, on a regional basis, the ability to quickly bring to bear teams with special expertise and equipment to respond to special threats. For example, the United States has Nuclear Emergency Support Teams (NESTs). The technical members of these teams are typically associated with the DOE National Laboratories so as to maintain the required special expertise. The nuclear weapons laboratories also develop and maintain the needed equipment. Many countries have special expertise similar to the NESTs that would be helpful in implementing their own nuclear detection architectures.

At the law enforcement level, Interpol should be a key player in international cooperation. At the level of technical cooperation, the IAEA would seem to be well positioned to be a key player. The IAEA has instituted the Regional Co-operative Agreement (RCA), which is an intergovernmental agreement for East Asia and the Pacific region in which the parties undertake, in cooperation with each other and the IAEA, to promote and coordinate cooperative research, development, and training projects in nuclear science and technology through their appropriate national institutions. Some appropriate variation on this approach could be the means to provide/maintain the regional technical expertise and equipment needed to assist regional law enforcement in exercising its responsibilities regarding nuclear smuggling and terrorism.

What is ultimately needed is to treat nuclear smuggling and terrorism as the law enforcement issue that it is. All of the means of national and international law enforcement should be brought to bear. Due to special aspects of nuclear smuggling and terrorism, law enforcement will, on occasion, need rapid access to specialized expertise and equipment.

Management of the U.S. role in international nuclear detection should include leadership by the White House, with implementation by several departments in clearly delineated roles. Close collaboration with the State Department’s Office of the Coordinator for Counterterrorism (S/CT) and implementation of the State Department’s Nuclear Smuggling Outreach Initiative will assist negotiators in forging partnerships with foreign governments participating in a coordinated approach to global nuclear detection and will permit maximum flexibility and efficiency in the use of resources.

Summary

Preventing terrorist organizations from acquiring and using nuclear weapons and related materials is one of the most important challenges facing the international community today. There is a real risk that clandestine networks of criminals with access to nuclear materials and smugglers with long experience in illicit trade can team up to provide well-financed terrorist organizations with nuclear materials.

The seriousness of the threat requires that U.S. Government efforts to deter nuclear terrorism be given the highest national security priority and the necessary funding to do the job expeditiously. While a number of U.S. Government departments and agencies operate programs aimed at combating this threat, a more targeted approach is needed.

To encourage broad international participation, we recommend using UNSCR 1540 as a spearhead to integrate international activities. This effort would be dedicated to the identification, detection, and interdiction of illicit nuclear and radiological materials and would work closely with the international law enforcement and intelligence communities to ensure that nuclear detection becomes routine practice, not only in the United States but also throughout the world. The seriousness of the threat necessitates that the United States and its international partners work closely together to deter, detect, and interdict nuclear terrorism.