



Testimony

Before the Subcommittees on the Prevention of Nuclear and Biological Attack and on Emergency Preparedness, Science, and Technology, Committee on Homeland Security, House of Representatives

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COMBATING NUCLEAR  
SMUGGLING

Efforts to Deploy Radiation  
Detection Equipment in the  
United States and in Other  
Countries

Statement of Gene Aloise, Director  
Natural Resources and Environment





Highlights of [GAO-05-840T](#), a testimony before the Subcommittees on the Prevention of Nuclear and Biological Attack and on Emergency Preparedness, Science, and Technology, Committee on Homeland Security, House of Representatives

## Why GAO Did This Study

According to the International Atomic Energy Agency, between 1993 and 2004, there were 650 confirmed cases of illicit trafficking in nuclear and radiological materials worldwide. A significant number of the cases involved material that could be used to produce either a nuclear weapon or a device that uses conventional explosives with radioactive material (known as a “dirty bomb”). Over the past decade, the United States has become increasingly concerned about the danger that unsecured weapons-usable nuclear material could fall into the hands of terrorists or countries of concern. In the aftermath of September 11, 2001, there is heightened concern that terrorists may try to smuggle nuclear materials or a nuclear weapon into the United States.

My testimony today summarizes the results of our previous reports on various U.S. efforts to combat nuclear smuggling both in the United States and abroad. Specifically, I will discuss (1) the different U.S. federal agencies tasked with installing radiation detection equipment both domestically and in other countries, (2) problems with coordination among these agencies and programs, and (3) the effectiveness of radiation detection equipment deployed in the United States and other countries.

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To view the full product, including the scope and methodology, click on the link above. For more information, contact Gene Aloise at (202) 512-3841 or [aloisee@gao.gov](mailto:aloisee@gao.gov).

# COMBATING NUCLEAR SMUGGLING

## Efforts to Deploy Radiation Detection Equipment in the United States and in Other Countries

### What GAO Found

Four U.S. agencies, the Departments of Energy (DOE), Defense (DOD), State, and Homeland Security (DHS), are implementing programs to combat nuclear smuggling by providing radiation detection equipment and training to border security personnel. From fiscal year 1994 through fiscal year 2005, the Congress has appropriated about \$800 million for these efforts, including about \$500 million to DOE, DOD, and State for international efforts and about \$300 million to DHS for installing radiation detection equipment at U.S. points of entry. The first major initiatives to combat nuclear smuggling concentrated on deploying radiation detection equipment at borders in countries of the former Soviet Union. In particular, in 1998, DOE established the Second Line of Defense program, which has installed equipment at 66 sites mostly in Russia through the end of fiscal year 2004. In 2003, DOE began its Megaports Initiative to focus on the threat posed by nuclear smuggling at major foreign seaports and to date has completed installations at two ports. Regarding efforts at U.S. points of entry, the U.S. Customs Service began providing its inspectors with portable radiation detection devices in 1998 and expanded its efforts to include larger-scale radiation detection equipment after September 11, 2001. This program is continuing under DHS, which reported in May 2005 that it has installed more than 470 radiation portal monitors nationwide at mail facilities, land border crossings, and seaports.

A common problem faced by U.S. programs to combat nuclear smuggling is the lack of effective planning and coordination among the responsible agencies. For example, we reported in 2002 that there was no overall governmentwide plan to guide U.S. efforts, some programs were duplicative, and coordination among U.S. agencies was not effective. We found that the most troubling consequence of this lack of effective planning and coordination was that the Department of State had installed less sophisticated equipment in some countries leaving those countries' borders more vulnerable to nuclear smuggling than countries where DOE and DOD had deployed equipment. Since the issuance of our report, the agencies involved have made some progress in addressing these issues. Regarding the deployment of equipment in the United States, we reported that DHS had not effectively coordinated with other federal agencies and DOE national laboratories on longer-term objectives, such as attempting to improve the radiation detection technology. We found that a number of factors hindered coordination, including competition between DOE national laboratories and the emerging missions of various federal agencies with regard to radiation detection.

The effectiveness of the current generation of radiation detection equipment is limited in its ability to detect illicitly trafficked nuclear material, especially if it is shielded by lead or other metal. Given the inherent limitations of radiation detection equipment and difficulties in detecting certain materials, it is important that the equipment be installed, operated, and maintained in a way that optimizes its usefulness. It is also important to note that the deployment of radiation detection equipment—regardless of how well such equipment works—is not a panacea for the problem of nuclear smuggling. Rather, combating nuclear smuggling requires an integrated approach that includes equipment, proper training of border security personnel in the use of radiation detection equipment, and intelligence gathering on potential nuclear smuggling operations.

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Messers. Chairmen and Members of the Subcommittees:

I am pleased to be here today to discuss our work assessing U.S. government efforts to combat nuclear smuggling both at home and in other countries through the deployment of radiation detection equipment at border crossings and other points of entry.<sup>1</sup> According to the International Atomic Energy Agency, between 1993 and 2004, there were 650 confirmed cases of illicit trafficking in nuclear and radiological materials worldwide. A significant number of the cases involved material that could be used to produce either a nuclear weapon or a device that uses conventional explosives with radioactive material (known as a “dirty bomb”). Over the past decade, the United States has become increasingly concerned about the danger that unsecured weapons-usable nuclear material<sup>2</sup> from the former Soviet Union or other countries could fall into the hands of terrorists or countries of concern. In the aftermath of September 11, 2001, there is heightened concern that terrorists may try to smuggle nuclear materials or a nuclear weapon into the United States. This could happen in several ways: nuclear materials could be hidden in a car, train, or ship; carried in personal luggage through an airport; or walked across an unprotected border. If terrorists were to smuggle a nuclear weapon or dirty bomb into the United States, the consequences could be devastating to our national and economic interests.

My testimony today summarizes the results of our previous reports on various U.S. efforts to combat nuclear smuggling both in the United States and in other countries. Specifically, I will discuss (1) the activities of the various U.S. federal agencies tasked with installing radiation detection equipment both domestically and in other countries, (2) problems with coordination and planning among these agencies and programs, and

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<sup>1</sup>See GAO, *Preventing Nuclear Smuggling: DOE Has Made Limited Progress in Installing Radiation Detection Equipment at Highest Priority Foreign Seaports*, [GAO-05-375](#) (Washington, D.C.: March 31, 2005); *Customs Service: Acquisition and Deployment of Radiation Detection Equipment*, [GAO-03-235T](#) (Washington, D.C.: October 17, 2002); *Nuclear Nonproliferation: U.S. Efforts to Help Other Countries Combat Nuclear Smuggling Need Strengthened Coordination and Planning*, [GAO-02-426](#) (Washington, D.C.: May 16, 2002); and related GAO products cited at the end of this testimony.

<sup>2</sup>Weapons-usable nuclear material is (1) uranium that has been enriched to consist of 20 percent or more of uranium-235 or uranium-233 isotopes and (2) any plutonium containing less than 80 percent of the isotope plutonium-238 and less than 10 percent of the isotopes plutonium-241 and plutonium-242. These types of materials are of the quality used to make nuclear weapons.

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(3) the effectiveness of radiation detection equipment deployed in the United States and other countries.

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## Summary

Four U.S. agencies, the Departments of Energy (DOE), Defense (DOD), State, and Homeland Security (DHS), are implementing programs to combat nuclear smuggling in the United States and other countries by providing radiation detection equipment and training to border security personnel. From fiscal year 1994 through fiscal year 2005, the Congress has appropriated about \$800 million for these efforts, including about \$500 million to DOE, DOD, and State for international efforts and about \$300 million to DHS for installing radiation detection equipment at U.S. points of entry. Initial concerns about the threat posed by nuclear smuggling were focused on nuclear materials originating in the former Soviet Union. As a result, the first major initiatives to combat nuclear smuggling concentrated on deploying radiation detection equipment at borders in countries of the former Soviet Union and in Central and Eastern Europe. In particular, in 1998, DOE established the Second Line of Defense program, which, through the end of fiscal year 2004, had installed equipment at 66 sites mostly in Russia. In 2003, DOE implemented a second program, the Megaports Initiative, to focus on the threat posed by nuclear smuggling at major foreign seaports. The Megaports Initiative has completed installations at two foreign seaports and is currently working to equip five others with radiation detection equipment. Regarding efforts to combat nuclear smuggling at U.S. points of entry, the U.S. Customs Service (now called the Bureau of Customs and Border Patrol) began providing its inspectors with portable radiation detection devices in 1998, and expanded its efforts to include larger-scale radiation detection equipment after September 11, 2001. This program is continuing under DHS. In May 2005, DHS reported that it has installed more than 470 radiation portal monitors nationwide at sites including international mail and package handling facilities, land border crossings, and seaports.

A common problem faced by U.S. programs to combat nuclear smuggling both domestically and in other countries is the lack of effective planning and coordination among the agencies responsible for implementing these programs. For example, regarding U.S. efforts to deploy radiation detection equipment in other countries, we reported in 2002 that there was no overall governmentwide plan to guide U.S. efforts, some programs were duplicative, and coordination among the various U.S. agencies involved with these efforts was not effective. We found that the most troubling consequence of this lack of effective planning and coordination was that different agencies had pursued separate approaches to installing radiation

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detection equipment at other countries' borders, and some agencies were installing better equipment than others. As a result, some countries' border crossings were more vulnerable to nuclear smuggling than others. Since the issuance of our report, a governmentwide plan encompassing U.S. international efforts to combat nuclear smuggling has been developed; duplicative programs have been consolidated; and coordination among the agencies, although still a concern, has improved. Regarding the deployment of equipment in the United States, we reported that DHS had not coordinated with other federal agencies and DOE national laboratories on longer-term objectives, such as attempting to improve the radiation detection technology used in portal monitors. We found that a number of factors hindered coordination, including competition between the DOE national laboratories and the emerging missions of various federal agencies with regard to radiation detection. DHS agreed with our assessment and told us that it is taking corrective actions to address these concerns.

The effectiveness of the current generation of radiation detection equipment is limited in its ability to detect illicitly trafficked nuclear material, especially if it is shielded by lead or other metal. In addition, the manner in which radiation detection equipment is deployed, operated, and maintained can also limit its effectiveness. For example, in October 2002, we testified that radiation pagers—small radiation detection devices worn by inspectors on their belts—have severe limitations and are inappropriate for some tasks. DOE officials told us that radiation pagers have a limited range and are not designed to detect weapons-usable nuclear material. Given the inherent limitations of currently deployed radiation detection equipment and difficulties in detecting certain dangerous nuclear materials, it is important that the equipment be installed, operated, and maintained in a way that optimizes its usefulness. We reported that the manner in which DHS had deployed radiation detection equipment at some U.S. points of entry reduced its effectiveness. For example, at one site we visited, DHS was allowing trucks to pass through portal monitors at speeds higher than what experts consider optimal for detecting nuclear material. Regarding U.S. assistance to help other countries combat nuclear smuggling, we found that serious problems with the installation, operation, and maintenance of equipment had undermined U.S. efforts. For example, we reported in 2002 that about half of the radiation portal monitors provided to one country in the former Soviet Union were never installed or were not operational. Additionally, we reported in March 2005, that DOE's Megaports Initiative faces technical challenges related to deploying radiation detection equipment at foreign seaports. For example, environmental conditions at many ports, such as the existence of high

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winds and sea spray, can affect radiation detection equipment's performance and sustainability.

It is important to note that the deployment of radiation detection equipment—regardless of how well the equipment performs—is not a panacea for the problem of nuclear smuggling. Rather, as we have noted in our past work, combating nuclear smuggling requires an integrated approach that includes equipment, proper training of border security personnel in the effective use of radiation detection equipment, and intelligence gathering on potential nuclear smuggling operations.

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## Background

Radiation detection equipment can detect radioactive materials used in medicine and industry; in commodities that are sources of naturally occurring radiation, such as kitty litter; and in nuclear materials that could be used in a nuclear weapon. The capability of the equipment to detect nuclear material depends on many factors, including the amount of material, the size and capacity of the detection device, the distance from the detection device to the nuclear material, and whether the material is shielded from detection. Detecting actual cases of illicit trafficking in weapons-usable nuclear material is complicated because one of the materials that is of greatest concern—highly enriched uranium—is among the most difficult materials to detect because of its relatively low level of radioactivity. In contrast, medical and industrial radioactive sources, which could be used in a radiological dispersion device (or “dirty bomb”), are highly radioactive and easier to detect. Because of the complexities of detecting and identifying nuclear material, customs officers and border guards who are responsible for operating detection equipment must also be trained in using handheld radiation detectors to pinpoint the source of an alarm, identify false alarms, and respond to cases of nuclear smuggling.

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## Several U.S. Agencies Have Programs to Combat Nuclear Smuggling

Four U.S. agencies have implemented programs to combat nuclear smuggling both domestically and in other countries by providing radiation detection equipment and training to border security personnel. From fiscal year 1994 through fiscal year 2005, the Congress has appropriated about \$800 million for these efforts, including about \$500 million to DOE, DOD, and State for international efforts and about \$300 million to DHS for installing radiation detection equipment at U.S. points of entry. Initial concerns about the threat posed by nuclear smuggling were focused on nuclear materials originating in the former Soviet Union. As a result, the first major initiatives to combat nuclear smuggling during the late 1990s concentrated on deploying radiation detection equipment at borders in

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countries of the former Soviet Union and in Central and Eastern Europe. Assistance included providing these countries with commercially available radiation detection equipment such as portal monitors (stationary equipment designed to detect radioactive materials carried by pedestrians or vehicles) and smaller, portable radiation detectors. In addition, U.S. agencies provided technical support to promote the development and enforcement of laws and regulations governing the export of nuclear-related technology and other equipment and training to generally improve these countries' ability to interdict nuclear smuggling.

One of the main U.S. efforts providing radiation detection equipment to foreign governments is DOE's Second Line of Defense program, which began installing equipment at key border crossing sites in Russia in 1998. According to DOE, through the end of fiscal year 2004, the Second Line of Defense program had completed installations at 66 sites, mostly in Russia. Additionally, in 2003, DOE began its Megaports Initiative, which seeks to install radiation detection equipment at major foreign seaports to enable foreign government personnel to screen shipping containers entering and leaving these ports for nuclear and other radioactive material. In March 2005, we reported that the Megaports Initiative had completed installations at two foreign ports and is currently working to equip five others with radiation detection equipment. Other U.S. agencies also have programs to provide radiation detection equipment and training to foreign governments, including two programs at the Department of State—the Nonproliferation and Disarmament Fund and Export Control and Related Border Security program—and two programs at DOD—the International Counterproliferation Program and the Weapons of Mass Destruction Proliferation Prevention Initiative.

In addition to these efforts at foreign borders, the U.S. Customs Service began providing its inspectors at U.S. borders and points of entry with small handheld radiation detection devices, known as radiation pagers, in fiscal year 1998. After September 11, 2001, this effort was expanded by DHS's Bureau of Customs and Border Patrol. In the spring of 2002, DHS conducted a pilot project to test the use of radiation portal monitors—larger-scale radiation detection equipment that can be used to screen vehicles and cargo. In October 2002, DHS began its deployment of portal monitors at U.S. points of entry. In May 2005, DHS reported that it has installed more than 470 radiation portal monitors nationwide at sites including international mail and package handling facilities, land border crossings, and seaports.

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## U.S. Programs to Combat Nuclear Smuggling in the United States and Other Countries Have Lacked Effective Planning and Coordination

A common problem faced by U.S. programs to combat nuclear smuggling both domestically and in other countries is the lack of effective planning and coordination among the agencies responsible for implementing these programs. Regarding assistance to foreign countries, we reported in 2002 that there was no overall governmentwide plan to guide U.S. efforts, some programs were duplicative, and coordination among the U.S. agencies was not effective. We found that the most troubling consequence of this lack of effective planning and coordination was that DOE, State, and DOD were pursuing separate approaches to enhancing other countries' border crossings. Specifically, radiation portal monitors installed in more than 20 countries by State are less sophisticated than those installed by DOE and DOD. As a result, some border crossings where U.S. agencies have installed radiation detection equipment are more vulnerable to nuclear smuggling than others.<sup>3</sup> We found that there were two offices within DOE that were providing radiation detection equipment and two offices within State that have funded similar types of equipment for various countries. We made several recommendations to correct these problems and, since the issuance of our report, a governmentwide plan encompassing U.S. efforts to combat nuclear smuggling in other countries has been developed; some duplicative programs have been consolidated; and coordination among the agencies, although still a concern, has improved.

Regarding efforts to deploy radiation detection equipment at U.S. points of entry, we reported that DHS had not coordinated with other federal agencies and DOE national laboratories on longer-term objectives such as attempting to improve the radiation detection technology used in portal monitors. We also noted that DHS was not sharing data generated by portal monitors installed at U.S. points of entry with DOE national laboratories other than Pacific Northwest National Laboratory, which is DHS's primary contractor for deploying radiation detection equipment at U.S. points of entry. Experts from DOE's national laboratories told us that achieving improvements to existing radiation detection technologies largely depends on analyzing data on the types of radioactive cargo passing through deployed portal monitors. We found that a number of factors hindered coordination, including competition between the DOE national laboratories and the emerging missions of various federal

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<sup>3</sup>Portal monitors installed by the Department of State do not have the ability to detect neutron radiation, which translates into a decreased ability of those monitors to be able to detect plutonium, one of the nuclear materials of greatest proliferation concern.



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agencies with regard to radiation detection. DHS agreed with our assessment and told us that it would be taking corrective actions.

Additionally, other DOE national laboratories and federal agencies are independently testing numerous different radiation portal monitors using a variety of nuclear and radiological materials and simulating possible smuggling scenarios. However, they are not sharing lessons learned or the results of these tests with other federal agencies. For example, DOD's Defense Threat Reduction Agency has a large testing facility near Sandia National Laboratories in New Mexico and has pilot tested radiation detection equipment at entrances to certain military bases. However, it is unclear how and with whom the results of such testing are shared to facilitate the development of improved radiation detection technologies. In April 2005, DHS announced its intent to create the Domestic Nuclear Detection Office (DNDO) to coordinate U.S. efforts to develop improved radiation detection technologies. DHS has requested over \$227 million in fiscal year 2006 to initiate this effort. Through DNDO, DHS plans to lead the development of a national test bed for radiation detection technologies at the Nevada Test Site.

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## Currently Deployed Radiation Detection Equipment Has Limitations

Recently, concerns have been raised about the ability of radiation detection equipment to detect illicitly trafficked nuclear material. As we have reported in the past, certain factors can affect the general capability of radiation detection equipment. In particular, nuclear materials are more difficult to detect if lead or other metal is used to shield them. For example, we reported in March 2005 that a cargo container containing a radioactive source passed through radiation detection equipment that DOE had installed at a foreign seaport without being detected because of the presence of large amounts of scrap metal in the container. Additionally, detecting actual cases of illicit trafficking in weapons-usable nuclear material is complicated because one of the materials of greatest concern in terms of proliferation—highly enriched uranium—is among the most difficult materials to detect due to its relatively low level of radioactivity.

The manner in which radiation detection equipment is deployed, operated, and maintained can also limit its effectiveness. Given the inherent limitations of currently deployed radiation detection equipment and difficulties in detecting certain nuclear materials, it is important that it be installed, operated, and maintained in a way that optimizes authorities' ability to interdict illicit nuclear materials. In our past reports, we have noted many problems with the radiation detection equipment currently

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deployed at U.S. and foreign borders. Specifically, in October 2002, we testified that radiation detection pagers have severe limitations and are inappropriate for some tasks. DOE officials told us that the pagers have a limited range and are not designed to detect weapons-usable nuclear material. According to U.S. radiation detection vendors and DOE national laboratory specialists, pagers are more effectively used in conjunction with other radiation detection equipment, such as portal monitors.

In addition, the manner in which DHS had deployed radiation detection equipment at some U.S. points of entry reduced its effectiveness. Specifically, we identified a wide range of problems, such as (1) allowing trucks to pass through portal monitors at speeds higher than what experts consider optimal for detecting nuclear material, (2) reducing the sensitivity of the portal monitors in an attempt to limit the number of nuisance alarms from naturally occurring radioactive materials, such as kitty litter and ceramics, and (3) not deploying enough handheld radiation detection equipment to certain border sites, which limited the ability of inspectors to perform secondary inspections on suspicious cargo or vehicles.

Regarding problems with the U.S. programs to deploy radiation detection equipment in other countries, we reported that:

- About half of the portal monitors provided to one country in the former Soviet Union were never installed or were not operational. Officials from this country told us that they were given more equipment than they could use.
- A radiation portal monitor provided to Bulgaria by the Department of State was installed on an unused road that was not expected to be completed for 1-1/2 years.
- Mobile vans equipped with radiation detection equipment furnished by the Department of State have limited utility because they cannot operate effectively in cold climates or are otherwise not suitable for conditions in some countries.
- DOE has found that environmental conditions at many seaports, such as the existence of high winds and sea spray, can affect radiation detection equipment's performance and sustainability.

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Environmental conditions are not the only challenge facing DOE and DHS in installing radiation detection equipment at seaports in the United States and other countries. One of the biggest challenges at seaports is adapting the equipment to the port environment while minimizing the impact on the flow of commerce and people. DOE's Megaports Initiative had made limited progress in installing radiation detection equipment at foreign seaports it had identified as highest priority largely due to concerns of some countries about the impact of radiation detection equipment on the flow of commerce through their ports. DHS has faced similar concerns from port operators in the United States.

It is important to note that radiation detection equipment is only one of the tools in the toolbox that customs inspectors and border guards must use to combat nuclear smuggling. Combating nuclear smuggling requires an integrated approach that includes equipment, proper training, and intelligence gathering on smuggling operations. In the past, most known interdictions of weapons-usable nuclear materials have resulted from police investigations rather than from detection by radiation detection equipment installed at border crossings. However, there have been recent reports of incidents where radioactive materials were discovered and seized as a result of alarms raised by radiation detection equipment. Because of the complexity of detecting nuclear material, the customs officers or border guards who are responsible for operating radiation detection equipment must also be well-trained in using handheld radiation detectors to pinpoint the source of an alarm, identifying false alarms, and responding to cases of nuclear smuggling. Without a clear understanding of how radiation detection equipment works and its limitations, inspectors may not be using the equipment as effectively as possible.

Although efforts to combat nuclear smuggling through the installation of radiation detection equipment are important, the United States should not and does not rely upon radiation detection equipment at foreign or U.S. borders as its sole means for preventing nuclear materials or a nuclear warhead from reaching the United States. Recognizing the need for a broad approach to the problem, the U.S. government has multiple initiatives that are designed to complement each other. For example, DOE is securing nuclear material at its source through the Material Protection, Control, and Accounting program, which seeks to improve the physical security of nuclear facilities in the former Soviet Union. In addition, DHS has other initiatives to identify containers at foreign seaports that are considered high risk for containing smuggled goods, such as nuclear material and other dangerous materials. Supporting all of these programs is intelligence information that can give us advanced notice of nuclear

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material smuggling and is a critical component to prevent dangerous materials from entering the United States.

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This concludes my prepared statement. I would be happy to respond to any questions that you or other Members of the Subcommittees may have.

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## Contact and Staff Acknowledgments

For further information about this testimony, please contact me at (202) 512-3841 or at [aloisee@gao.gov](mailto:aloisee@gao.gov). R. Stockton Butler, Julie Chamberlain, Nancy Crothers, Christopher Ferencik, Emily Gupta, Jennifer Harman, Winston Le, Glen Levis, F. James Shafer, Jr., and Gene Wisnoski made key contributions to this statement.

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# Related GAO Products

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*Preventing Nuclear Smuggling: DOE Has Made Limited Progress in Installing Radiation Detection Equipment at Highest Priority Foreign Seaports.* [GAO-05-375](#). Washington, D.C.: March 31, 2005.

*Weapons of Mass Destruction: Nonproliferation Programs Need Better Integration.* [GAO-05-157](#). Washington, D.C.: January 28, 2005.

*Customs Service: Acquisition and Deployment of Radiation Detection Equipment.* [GAO-03-235T](#). Washington, D.C.: October 17, 2002.

*Container Security: Current Efforts to Detect Nuclear Materials, New Initiatives, and Challenges.* [GAO-03-297T](#). Washington, D.C.: November 18, 2002.

*Nuclear Nonproliferation: U.S. Efforts to Combat Nuclear Smuggling.* [GAO-02-989T](#). Washington, D.C.: July 30, 2002.

*Nuclear Nonproliferation: U.S. Efforts to Help Other Countries Combat Nuclear Smuggling Need Strengthened Coordination and Planning.* [GAO-02-426](#). Washington, D.C.: May 16, 2002.

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