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Report to Congressional Requesters

April 2003

RAIL SAFETY AND SECURITY

Some Actions Already Taken to Enhance Rail Security, but Risk-based Plan Needed

GAO-03-435

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Highlights

Highlights of GAO-03-435, a report to Congressional Requesters

Why GAO Did This Study

In the wake of the terrorist attacks of September 11, 2001, concerns have been raised that the nation's shipments of hazardous materials by rail may be vulnerable to terrorist attack. Millions of tons of hazardous materials are shipped yearly across the United States. Serious incidents involving these materials have the potential to cause widespread disruption or injury. GAO was asked to examine recent steps taken by industry and government to improve the safety and security of these shipments and steps taken by local jurisdictions to prepare to respond to hazardous material rail incidents.

What GAO Recommends

GAO recommends that the Secretary of Homeland Security work with the Secretary of Transportation to develop a risk-based plan to specifically address rail security. The plan should establish time frames for actions to protect hazardous material rail shipments. Department of Transportation and Homeland Security officials generally agreed with the report and acknowledged that no plan to specifically address rail security has been developed, but noted that they have taken some actions to enhance the security of hazardous material rail shipments.

www.gao.gov/cgi-bin/getrpt?GAO-03-435.

To view the full report, including the scope and methodology, click on the link above. For more information, contact Peter F. Guerrero at (202) 512-2834 or guerrerop@gao.gov.

What GAO Found

After the response to the September 11, 2001, terrorist attacks, industry and government took steps to improve the safety and security of hazardous material rail transportation. The railroad and chemical industries assessed their facilities' exposure to attack and developed a security plan to address their risks. The Department of Homeland Security's Transportation Security Administration has begun to address nonaviation security by starting development of an overall intermodal transportation system security plan, but has not yet developed specific plans to address the security of individual surface transportation modes, including rail. Such a plan is needed to determine the adequacy of security measures already in place to protect rail shipments and identify security gaps.

Officials from local jurisdictions that GAO visited, as well as other government and private sector experts, identified several unresolved issues pertaining to the safety and security of transporting hazardous materials by rail. These include the need for measures to better safeguard hazardous materials temporarily stored in rail cars while awaiting delivery to their ultimate destination and the advisability of requiring companies to notify local communities on the type and quantities of such materials stored or passing through their communities.

While no standardized tool exists to gauge local preparedness, officials from nine of the ten cities that GAO visited said that they are generally prepared to respond to hazardous materials incidents. By the end of 2004, the Department of Homeland Security plans to determine the response capabilities of the nation by developing an assessment tool for use by states in performing assessments of their local communities' emergency response capabilities.

A Hazardous Material Rail Tank Car

Source: Department of Homeland Security.

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Abbreviations

AAR	Association of American Railroads
CFDA	Catalog of Federal Domestic Assistance
CFS	Commodity Flow Survey
CHEMTREC	Chemical Transportation Emergency Center
DHS	Department of Homeland Security
DOD	Department of Defense
DOE	Department of Energy
DOJ	Department of Justice
DOL	Department of Labor
DOT	Department of Transportation
EMAP	Emergency Management Accreditation Program
EPA	Environmental Protection Agency
EP&R	Emergency Preparedness and Response
FRA	Federal Railroad Administration
HHS	Department of Health and Human Services
HM	hazardous materials
LEPC	local emergency planning committee
MTMC	Military Traffic Management Command
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
NTSB	National Transportation Safety Board
ODP	Office of Domestic Preparedness
OREIS	Operation Respond Emergency Information System
OSHA	Occupational Safety and Health Administration
PFS	Private Fuel Storage, LLC
RSPA	Research and Special Programs Administration
SNF	spent nuclear fuel
TRANSCAER	Transportation Community Awareness Emergency Response Program
TSA	Transportation Security Administration
USCG	U.S. Coast Guard
WMD	weapons of mass destruction

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United States General Accounting Office
Washington, D.C. 20548

April 30, 2003

The Honorable Henry A. Waxman
Ranking Minority Member
Committee on Government Reform
House of Representatives

The Honorable James L. Oberstar
Ranking Minority Member
Committee on Transportation and Infrastructure
House of Representatives

The Honorable Elijah E. Cummings
The Honorable Martin T. Meehan
House of Representatives

In the wake of the terrorist attacks of September 11, 2001, concerns have been raised that the nation's shipments of hazardous materials by rail may be vulnerable to terrorist attack. Millions of tons of hazardous materials are shipped yearly across the continental United States. Much of this volume is shipped on rail networks that travel through populated areas, increasing the concern that accidents or attacks during these shipments could have severe consequences. While the vast majority of shipments arrive safely at their destination, serious incidents involving these materials have the potential to cause widespread disruption or injury. Additionally, the proposed shipments of spent nuclear fuel at sites from 39 states across the country to the Yucca Mountain Repository have highlighted the need to safeguard hazardous materials against both accident and attack.[1]

Two federal agencies have primary responsibility for overseeing the safety and security of hazardous materials shipped by rail—the Department of Transportation (DOT) and the new Department of Homeland Security (DHS). Though originally a part of DOT, the Transportation Security Administration is now part of DHS. The Transportation Security Administration is charged with overseeing the security of all modes of transportation, including rail. Within DOT, the Federal Railroad Administration promotes railroad safety and enforces rail safety

[1]The proposed Yucca Mountain Repository is not scheduled to begin operations until 2010. For information on the safety and security issues posed by possible future rail shipments of spent nuclear fuel, see appendix IV.

regulations, while the Research and Special Programs Administration regulates the transportation of materials that may pose an unreasonable risk to health, safety, and property. Other federal agencies having related responsibilities for the rail shipment of hazardous materials include the Nuclear Regulatory Commission, Department of Energy, Department of Defense (DOD), Environmental Protection Agency (EPA), Department of Labor's Occupational Safety and Health Administration, and DHS' Directorate of Emergency Preparedness and Response. See appendix II for additional information on the oversight roles of DOT and other federal agencies in the safety and security of hazardous material rail shipments.

In response to your request that we review the safety and security of transporting hazardous materials by rail in the United States, we examined (1) recent steps taken by industry and government for improving the safety and security of hazardous materials transported by rail, (2) issues pertaining to the safety and security of rail transport of hazardous materials identified by federal and private sector hazardous material transportation experts and local officials as being unresolved, and (3) the preparedness of ten local jurisdictions to respond to rail incidents involving hazardous materials, whether accidental or intentional. To address these issues, we used a variety of approaches and methodologies, including interviews with regulatory officials, analyses of hazardous materials volume and incident data, a panel of experts, and interviews with local officials. To report on the preparedness of local jurisdictions to respond to a potential terrorist attack or accident involving the shipment of hazardous materials by rail, we performed case studies at ten jurisdictions selected because they varied in size and experienced a recent and significant rail incident involving hazardous materials or typically experienced large amounts of hazardous material shipments passing through their communities. These jurisdictions are not named due to the sensitive nature of the issues discussed in this report. While providing information on the preparedness actions taken by these specific localities to respond to a hazardous material rail incident, results from these case studies cannot be generalized to other jurisdictions. We conducted our review from December 2001 through March 2003 in accordance with generally accepted government auditing standards. See appendix I for additional information on our scope and methodology.

Results in Brief

In response to the September 11, 2001, terrorist attacks, industry and government have taken steps to improve the safety and security of the transportation of hazardous materials by rail. The railroad industry conducted an industry-wide assessment to identify and prioritize the

exposure of rail facilities to the risk of attack and developed a security plan to address these risks. The security plan, completed in December 2001, established four alert levels and described a series of actions to prevent terrorist threats to railroad personnel and facilities that could be taken at each alert level, including rail operations and police actions. In March 2003, DOT's Research and Special Programs Administration finalized a rule, Hazardous Materials—Security Requirements for Offerors and Transporters of Hazardous Materials—which imposes new security requirements on shippers and carriers of certain hazardous materials. The Transportation Security Administration has also begun to address rail security. According to Transportation Security Administration officials, while much of its resources have been focused on aviation security, it has assumed responsibility for transportation security in all modes of transportation, including rail, and is beginning to develop an overall intermodal transportation system security plan, which these officials consider a major component of the National Strategy for Homeland Security. The Transportation Security Administration has signed a memorandum of agreement with the Federal Aviation Administration, which these officials said would serve as a guide for relations between the Transportation Security Administration and modal administrations within DOT, including the Federal Railroad Administration and Research and Special Programs Administration. However, while the Transportation Security Administration has begun work on an overall intermodal transportation system security plan, it has not yet developed specific plans to address the security of individual surface transportation modes, including rail, and does not have time frames established for completing such an effort. We are recommending that DHS and DOT work jointly to develop such a plan to assist the departments in determining the adequacy of security measures already in place to protect hazardous material rail shipments and identifying any gaps that need to be addressed.

Government and private sector hazardous material experts and officials from some local jurisdictions that we visited identified several issues pertaining to the safety and security of transporting hazardous materials by rail that have not been resolved. These issues include the need for measures to better safeguard hazardous materials temporarily stored in rail cars while awaiting delivery to their ultimate destination—a practice commonly called "storage-in-transit," the advisability of requiring companies to notify local communities of the type and quantities of materials stored in transit, and the appropriate amount of information rail companies should be required to provide local officials regarding hazardous material shipments passing through their communities. Federal

Railroad Administration and Transportation Security Administration officials recognize that security concerns have grown since the September 11, 2001, terrorist attacks regarding the vulnerability of hazardous materials stored in transit in, or passing through, local communities. However, they are just beginning to address this issue.

In our review of the actions taken by the ten local communities that we visited to prepare and respond to hazardous material rail incidents, officials from nine of the ten localities told us that they believe that their cities are generally prepared to respond to these incidents. Actions taken by these communities include ensuring that emergency response plans are in place, employing hazardous material response teams, and planning and conducting training and drills. However, because no standardized tool currently exists to gauge preparedness, we were unable to determine the sufficiency of these localities' actions to prepare for hazardous material rail incidents. Officials from DHS' Directorate of Emergency Preparedness and Response[2] are in the process of determining the response capabilities of the nation by developing a standardized tool for performing self-assessments of local communities' emergency response capabilities. They estimate that this effort will be completed by the end of 2004.

DHS and DOT generally agreed with our report and acknowledged that no plan to specifically address rail security has been developed, but stressed that they have taken some actions to enhance the security of hazardous material rail shipments.

Background

In 2001, over 83 million tons of hazardous materials were shipped by rail in the United States across a 170,000-mile rail network which extends through every major city as well as thousands of small communities. Federal hazardous material transportation law defines a hazardous material as a substance or material that the Secretary of Transportation has determined

[2]This Directorate includes the entire functions of the Federal Emergency Management Agency, formerly an independent federal agency.

is capable of posing an unreasonable risk to health, safety, and property when transported in commerce.[3] It includes hazardous substances such as ammonia, hazardous wastes from chemical manufacturing processes, and elevated temperature materials such as molten aluminum.[4]

According to reported incident data from the DOT's Research and Special Programs Administration (RSPA), the number of hazardous material incidents occurring during rail transportation declined from 1,128 in 1992 to 894 in 2001 and accounted for approximately 7 percent of all incidents involving the transportation of these materials in all modes. For the period 1997 to 2001, hazardous material rail shipments represented an annual average of approximately 11 incidents and less than 1 serious incident per million tons of hazardous materials shipped by rail.[5] For 1997, the latest year for which data on intermodal hazardous material shipment volumes are available, there were approximately 14 incidents and less than 1 serious incident per million tons of hazardous materials shipped by truck.

Although rail moves only a small percentage of all hazardous materials, it is the predominant method of transportation for some types of these materials, such as flammable solids.[6] When measured in ton-miles,[7] hazardous materials shipped by rail are nearly equivalent to hazardous materials transported by road and water.[8] The vast majority of shipments arrive safely at their destination. However, recent accidents in urban areas, such as the 2001 incident in the Howard Street Tunnel in Baltimore, Maryland, involving a fire fueled by hazardous materials, and a leak of hydrochloric acid from a parked tank car in an urban area in Lowell,

[3]49 U.S.C. § 5103.

[4]Where specific references to flammable, radioactive, or other subsets of material are needed, the distinction will be made in the report.

[5]RSPA defines an incident as an unintentional release of hazardous materials during the course of transportation. A serious incident is defined as an incident that involves a fatality or major injury, substantial property damage, closure of a major transportation artery or facility, or evacuation due to a hazardous material release.

[6]Appendix III contains additional information on the amounts and types of hazardous materials shipped by rail throughout the United States.

[7]A ton-mile is a measure of volume that accounts for the distance a commodity is shipped. One ton-mile is equal to one ton shipped one mile.

[8]See appendix III for additional discussion on ton-mile shipments by transportation mode.

Massachusetts, have called attention to the safety of hazardous materials shipped by rail. The events of September 11, 2001, and subsequent reviews of the vulnerability of the transportation sector, including rail, to terrorist attack have further focused attention on the security of hazardous materials in rail transport.

The proposed plan to ship spent nuclear fuel, as soon as 2010 and most likely by rail, to the Yucca Mountain Repository in Nevada—the nation's first long-term geologic repository for spent nuclear fuel and high-level radioactive waste—has raised concerns about the safety and security of possible transportation to this site.[9] A second proposal to ship spent nuclear fuel to temporary storage in a private facility in Utah has heightened these concerns.[10] Such shipments would substantially increase the volume of nuclear material transported in this country.[11]

Two administrations within DOT, RSPA and the Federal Railroad Administration (FRA), have responsibilities, respectively, for developing regulations pertaining to the transportation of hazardous materials and for rail safety. RSPA is responsible for identifying and regulating the transportation of materials that may pose an unreasonable risk to health, safety, and property when transported in commerce. RSPA develops the hazardous material regulations, coordinating its work with other DOT administrations, including FRA. These regulations specify how shipments must be identified, packaged, and handled in transit.

RSPA published a final rule in the March 25, 2003, *Federal Register*—Hazardous Materials: Security Requirements for Offerors and Transporters of Hazardous Materials, also known as HM-232—which imposes new security requirements on shippers and carriers of certain hazardous materials. The final rule requires people who offer or transport hazardous

[9]Nuclear fuel is generally used in a nuclear reactor for a number of years before losing its ability to efficiently create energy. When the fuel can no longer effectively produce energy, it is considered "spent" and is replaced, but the spent fuel remains radioactive and hazardous.

[10]In March 2003, a Nuclear Regulatory Commission licensing board blocked, for the time being, the issuance of a license to this private facility because of the risks that military aircraft operations conducted near the facility might pose.

[11]Appendix IV contains additional information on safety issues associated with Yucca Mountain and the Utah facility. We are also currently undertaking a study assessing the findings of federally-sponsored studies of sabotage and severe accidents involving spent fuel.

materials in amounts that require placarding to develop and implement a written security plan. The security plan must include an assessment of possible transportation security risks for the material(s) to be transported and appropriate measures to address identified risks. Specific measures established by the plan may vary depending on the level of threat at a particular time. In addition, the final rule requires all employees handling hazardous materials to receive security awareness training, beginning no later than the date of their first scheduled recurrent training. New employees must receive security awareness training within 90 days of employment. Employees handling hazardous materials in companies subject to the security plan requirement must receive in-depth training concerning the security plan and its implementation.

FRA oversees the safety of railroad equipment and operating practices and has authority to enforce compliance with the hazardous material regulations. DOT's regulation of the transport of hazardous materials under federal hazardous material transportation law preempts similar regulation by state and local agencies. States and local jurisdictions may not establish stricter or less stringent regulations governing hazardous material transportation.[12]

The Transportation Security Administration (TSA), created within DOT in the immediate aftermath of the terrorist attacks of September 11, 2001, and now part of the newly created DHS, initially focused primarily on aviation issues but, along with DOT, is responsible for the security of all modes of transportation, including rail. According to TSA officials, the Secretary of Transportation and the Administrator for TSA have exchanged letters regarding the ongoing cooperation and relationship between TSA and the DOT operating administrations after the March 1, 2003, transfer of TSA from DOT to DHS. This correspondence sets forth a number of principles to guide this relationship.

[12]Preemption occurs when Congress enacts a statute intending to preclude inconsistent state or local law. Depending upon the circumstances, Congress may choose to preempt all or only some forms of state or local rulemaking. The law preempts any inconsistent state or local rulemaking.

Several other federal agencies also play a role in regulating rail shipments of hazardous materials. The Nuclear Regulatory Commission (NRC) and Department of Energy (DOE) oversee shipments of nuclear material. Although DOT regulates the transportation of radioactive material, including spent fuel, as a hazardous material, NRC also regulates the transportation of radioactive material by its licensees. The primary role of NRC, under a memorandum of agreement with DOT, is the establishment of packaging standards for fissile materials and for other radioactive materials exceeding certain limits.[13] NRC certifies spent fuel casks and other radioactive material package designs that meet these standards and requires its licensees to use certified casks for transport. NRC also plays a significant role through safety and security requirements and through inspection and enforcement. In its role as developer of the Yucca Mountain Repository, DOE is responsible for shipping spent nuclear fuel from nuclear plants. In addition, DOE coordinates policies and program implementation for shipments of radioactive waste with DOT and NRC.

The Department of Defense's (DOD) Military Traffic Management Command is responsible for DOD's surface transportation shipments and requires that everyone participating in the shipment of DOD hazardous materials comply with hazardous material regulations. DOD also requires inspections for sensitive shipments, including hazardous materials, to be conducted by railroad police officers, trained railroad employees, or members of private security firms under contract to DOD.

The Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) each have oversight responsibility regarding facilities that handle hazardous materials and are the source or destination of many hazardous material rail shipments. EPA, along with the U.S. Coast Guard (USCG), has authority for implementing and enforcing legislation governing the protection of public health and the environment against chemical and other polluting discharges and for abating and controlling pollution when spills occur. EPA has provided training and technical assistance to states and localities to enhance contingency planning and emergency response capabilities. EPA sometimes participates with other agencies in responding to hazardous material transportation incidents. OSHA promulgates and enforces standards to protect the safety and health

[13]Fissile material is any material fissionable by slow neutrons. This involves splitting a nucleus into at least two other nuclei and the release of a relatively large amount of energy. The three primary fissile materials are uranium-233, uranium-235, and plutonium-239.

of employees, including workers at facilities that handle hazardous materials and emergency responders to hazardous material incidents.

The USCG enforces spill prevention regulations on vessels and on the marine transfer portion of waterfront facilities. Under the National Contingency Plan, the USCG serves as the federal on scene coordinator for oil or hazardous substance releases in the coastal zone. All oil and hazardous material incidents are required to be reported to the National Response Center, which in turn is to notify state and local agencies and the appropriate on scene coordinator (either EPA for inland or USCG for coastal incidents). In each case, the on scene coordinator is to assess the need for federal involvement and, if appropriate, may respond, bringing additional response resources (such as contractors), special teams, and access to federal funding for hazardous material or oil spills.

The Emergency Preparedness and Response (EP&R) Directorate within DHS provides federal assistance to supplement the resources of state and local governments in major disasters, which could include emergencies involving hazardous material releases. Its assistance is governed by the Federal Response Plan that provides the mechanism for delivery of federal assistance and resources to augment state and local government efforts in a major disaster or emergency. In conjunction with NRC, DOE, DOD, EPA, and other agencies, DHS' EP&R also participates in the Federal Radiological Emergency Response Plan to establish an organized and integrated capability for timely, coordinated response by federal agencies to peacetime radiological emergencies. For more details on the roles of various federal agencies in assisting state and local governments to respond to emergencies, see appendix V.

Industry Has Taken Steps to Address the Security of Transportation of Hazardous Materials by Rail, but TSA Has Not Yet Developed and Implemented a Rail Security Plan

The railroad and chemical industries have taken a number of steps to enhance the security of transportation of hazardous materials. Some of these measures include the development of a rail security plan and an increase in security measures at some facilities. According to TSA officials, while much of TSA's resources have been focused on aviation security, TSA has assumed its responsibility for transportation security in all modes of transportation, including rail, and is beginning to develop an intermodal national transportation system security plan, which TSA officials consider to be a major component of the National Strategy for Homeland Security. Another TSA effort in this area involves the development of a memorandum of agreement with DOT's Federal Aviation Administration, which DOT officials said would serve as a guide for relations between TSA and modal administrations within DOT, including FRA and RSPA.

Although TSA has begun work on an overall intermodal transportation system security plan, it has not yet developed a plan to specifically address the security of individual surface transportation modes, including rail, and does not have time frames established for completing such an effort. The development of a security plan addressing rail transportation of hazardous materials that uses a risk-based management approach, such as that used by other federal agencies, government commissions, and multinational corporations to defend against terrorism, would assist TSA in identifying threats that exist to the shipment of hazardous materials by rail, vulnerabilities that may be exploited in the system used to ship these materials, and high-risk, high-consequence facilities that need protection.

Railroad Industry Has Developed a Security Plan and Taken Other Steps

Prior to the terrorist attacks of September 11, 2001, railroad companies' security efforts focused primarily on the prevention of theft at rail facilities. Representatives of several major railroad companies told us that they had toll-free emergency telephone numbers to report suspicious activity, including theft, in place before the terrorist attacks. According to a representative from the Association of American Railroads (AAR), which represents the major freight railroads in the United States, Mexico, and Canada, railroad companies currently employ over 1,000 police officers.

Within two weeks of the terrorist attacks of September 11, 2001, AAR created a railroad security task force to analyze the industry's risk from and response to the threat of terrorism. AAR worked jointly with several chemical industry associations and consultants from a security firm to develop the industry's security management plan.[14] As part of this effort, AAR created critical action teams to assess the rail industry's security in five areas: infrastructure, military operations, information technology and communications, security of operations, and hazardous materials. The plan that resulted from this effort was presented to its member railroads and TSA in December 2001. It established four alert levels and described a graduated series of actions to prevent terrorist threats to railroad personnel and facilities that correspond to each alert level. The actions include progressively rigorous countermeasures to be taken in the areas of operations, information technology and communications, and police. The countermeasures include actions to heighten security awareness, limit the sharing of information about sensitive shipments, and test that security systems are operating as intended. With U.S. military action in Iraq, the railroad industry has taken additional security steps, including real-time monitoring and additional surveillance of designated trains; increased security at some rail yards; and increased inspection of priority railroad tracks, tunnels, and bridges.

Representatives of several major railroad companies and the railroad industry told us that the railroads have implemented a number of new security measures since the terrorist attacks of September 11, 2001, including the following:

- increasing the awareness of employees about potential security threats;
- enhancing dispatch command and control centers;
- monitoring hazardous materials with video surveillance;
- restricting access to facilities through the use of key cards;
- installing better lighting, fencing, and barricades at rail facilities;

[14]See U.S. General Accounting Office, *Homeland Security: Voluntary Initiatives Are Under Way at Chemical Facilities, but the Extent of Security Preparedness Is Unknown*, GAO-03-439 (Washington, D.C.: Mar. 14, 2003) for information on voluntary actions that the chemical industry has taken to address security preparedness and the challenges that it faces in protecting its assets and operations.

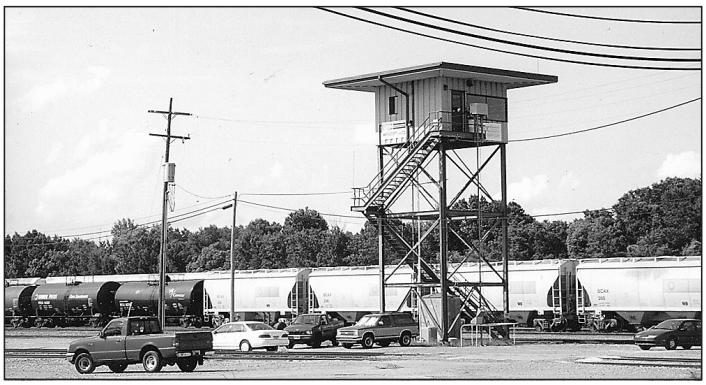
- monitoring of critical infrastructure locations by police officers and contracted security guards;
- employing additional security officers to protect hazardous materials in storage;
- instituting more threat information sharing with the Federal Bureau of Investigation, as well as state and local government agencies;
- conducting security evaluations of rail facilities;
- limiting access to electronic tracking of shipments of hazardous materials; and
- conducting "red team" assault tests in which rail companies send undercover security officers to test employees' responses to trespassers.

We visited rail facilities at five locations, in part to observe security measures there. Overall, we observed more physical security measures at large rail facilities than at smaller facilities. Both the small and large facilities we visited had signs indicating that trespassing was not permitted and that railroad personnel were on duty part of or all day. In addition, the large facilities had security video cameras, lights, observation towers staffed by railroad personnel that can be used as security lookouts, and fencing along some parts of the facility. However, all of the facilities we visited could be readily accessed because they are not fenced or fences did not completely separate the facilities from adjacent areas, and some of the facilities did not have gates around them. Figure 1 shows photos of rail facilities in some of the case study locations we visited. We observed the following during our visits:

- rail companies relied heavily on the vigilance of employees;
- employees provided photo identifications upon request, but were not required to display them;
- the presence of security guards varied; and
- at intermodal facilities, where hazardous material products are transferred between rail cars and trucks for continued shipment,

procedures were in place to check for tampering with the valves of tank cars transporting hazardous materials.

Figure 1: Photos of Rail Facilities



Observation tower at a rail facility

Source: GAO.

Gated entrance at an intermodal rail facility

Source: GAO.

Entrance to a rail facility

Source: DHS.

Despite reporting that they had implemented enhanced security measures, railroad industry representatives told us that it is not possible to eliminate all vulnerabilities and, without government assistance, the industry lacks the resources to counter a significant terrorist attack.

TSA Is Beginning to Address Rail Security

Since its creation in November 2001, TSA has primarily focused on improving aviation security to meet the deadlines established in the Aviation and Transportation Security Act for TSA to assume civil aviation security functions and responsibilities, such as implementing federal passenger screening. As a result, TSA has not yet assumed full responsibility for security in other modes of transportation, such as rail.

The establishment of TSA's Office of Maritime and Land Security in March 2002 marked the beginning of TSA's efforts to address security in other modal areas, including the security of rail transportation. The goals for this office are to prevent terrorist attacks, protect transportation without impeding movement, and respond to transportation accidents or incidents promptly.

TSA's Office of Maritime and Land Security plans to hire 200 employees to cover all 50 states by 2004, subject to resource constraints. As of March 2003, the office had filled 83 of the 200 positions. TSA officials said that since the office's eventual staff will be relatively small, the office plans to work jointly with DOT to maximize resources by relying on other modal administrations to cover day-to-day security operations. According to TSA officials, the office will focus on identifying security gaps and improving security plans in each mode.

TSA Has Taken Some Steps to Address the Security of Hazardous Material Transportation by Rail, but Has Not Yet Developed a Rail Security Plan

TSA has taken some steps to address the security of hazardous material rail shipments, including starting the development of an intermodal transportation system security plan, establishing working relationships with DOT's modal administrations, and conducting an initial review of the rail industry's own security rail plan. In March 2003, DHS launched Operation Liberty Shield to help protect the nation's infrastructure and deter possible terrorist attacks. Among other things, this national plan calls for (1) state governors to provide additional police or National Guard forces at selected railroad bridges; and (2) railroad companies to improve the security of major rail facilities and hubs, monitor shipments of hazardous materials, and increase the surveillance of trains carrying these materials. Nevertheless, TSA has not yet developed a security plan for rail

that systematically determines the adequacy of security measures already in place and identifies gaps that need to be addressed.

TSA officials told us that they and officials in other components of DHS are working on a national transportation system security plan to address the security challenges of the nation's transportation system using a threat-based and risk management approach. This plan is to address the intermodal aspects of the transportation system first and then to provide a strategic framework for future TSA activities in transportation security. TSA officials said that they hope to have the key components of this intermodal plan in place by May 2003 and after that time they will consider security on individual transportation modes, including rail. TSA has also signed a memorandum of agreement with DOT's Federal Aviation Administration, which DOT officials said would serve as a guide for relations between TSA and DOT's modal administrations, including FRA and RSPA.

TSA's Office of Maritime and Land Security officials told us that they have reviewed AAR's security plan, and they credited AAR for its efforts in conducting a very aggressive vulnerability assessment. The TSA officials said that they are considering using aspects of the AAR assessment as the basis for a model that TSA plans to develop on how to conduct vulnerability assessments. However, the officials noted that some areas of AAR's plan need to be clarified, such as what specific measures individual railroad companies will be expected to implement. FRA officials have also reviewed AAR's plan and commented that AAR needs to identify mitigating actions more specifically.

TSA officials told us they are planning to undertake projects in the future that we believe could become part of a rail security plan, including the development of physical security standards and an assessment of vulnerable hazardous material transportation areas. As a first step, officials said that they plan to visit seaport facilities, which face similar threats to protecting hazardous material shipments as rail facilities do, to determine what physical security standards could be applied to other modes of transportation, in areas such as facility lighting levels or monitoring by closed-circuit televisions. Given their initial focus on aviation security priorities, TSA officials said they have not yet established time frames for developing these physical security standards or conducting a vulnerability assessment of the rail industry. FRA officials told us that they are working with TSA on their efforts to develop and implement federal standards for railroad security.

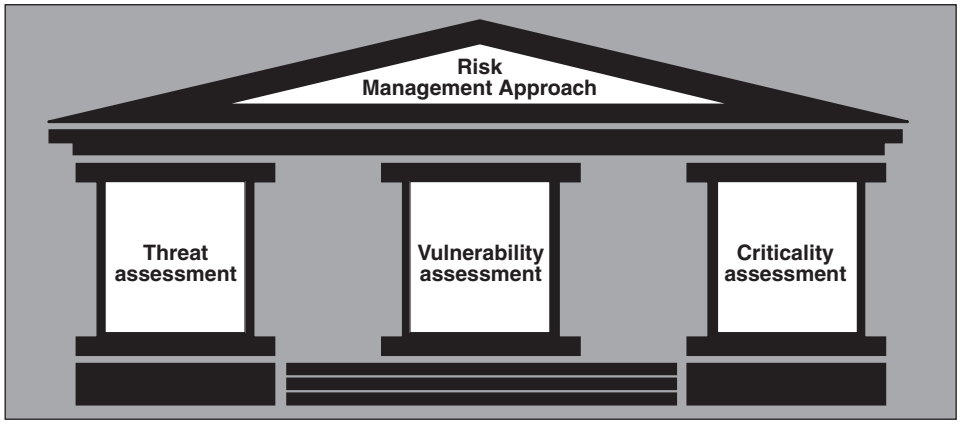
The development of a security plan addressing rail transportation of hazardous materials that uses a risk-based management approach would assist TSA by providing a strategy to identify threats to these shipments, vulnerabilities that may be targeted in the system used to ship these materials, and high-risk, high consequence facilities that need protection. Although TSA has taken steps and is considering future measures to address the security of hazardous material rail shipments, it does not yet have a risk-based plan to guide its actions specifically in this area. Until TSA develops such a plan, it will not know whether resources are being deployed as effectively and efficiently as possible to reduce the risk of possible terrorist attacks.

In our previous work on homeland security, we have determined that the federal government can benefit from a risk management approach to defend against terrorism.[15] This approach can provide organizations with a process for enhancing their preparedness to respond to terrorist attacks and to permit better direction of national finite resources to areas of highest priority. Figure 2 shows the components of a risk management approach to defend against terrorism. This approach includes the following:

- a threat assessment to identify and evaluate potential threats on the basis of factors such as capabilities, intentions, and impact of an attack;
- a vulnerability assessment to identify weaknesses that may be exploited by identified threats and suggest options to address those weaknesses; and
- a criticality assessment to evaluate and identify assets and infrastructure in terms of specific criteria such as their importance to public safety and the economy.

[15]For additional information on the applicability of risk management to homeland security, see: U.S. General Accounting Office, *Homeland Security: A Risk Management Approach Can Guide Preparedness Efforts*, GAO-02-208T (Washington, D.C.: Oct. 31, 2001).

Figure 2: Components of a Risk Management Approach to Defend Against Terrorism



Source: GAO.

Several Issues Regarding the Safety and Security of Hazardous Materials Transported by Rail Remain Unresolved

Our discussions with federal and private sector hazardous material transportation experts and local community officials identified several issues that, in their opinion, remain unresolved regarding the safe and secure transportation of hazardous materials by rail. These issues include the need for measures to better safeguard hazardous materials stored in rail cars while awaiting delivery to a final destination—a practice commonly referred to as "storage-in-transit"—the advisability of requiring companies to notify local communities of the type and quantities of materials stored in transit, and the appropriate amount of information rail companies should be required to provide local officials regarding hazardous material shipments passing through their communities.

Concerns about the Safety and Security of Hazardous Materials Stored in Transit Have Not Yet Been Fully Addressed

The terrorist attacks of September 11, 2001, have raised concerns about the exposure and vulnerability of hazardous materials stored in transit in chemical rail cars on rail sidings and in rail yards. Emergency response officials in three of the locations we visited identified storage-in-transit as a safety and security concern for their communities.

The local officials said that they were aware of rail cars that were unsecured and, in some cases, provided photographs or videotape as evidence of the lack of security. According to these local officials, unmonitored chemical cars could develop undetected leaks that could

threaten the nearby population and environment. A May 31, 2002, hydrochloric acid leak from a rail car in Lowell, Massachusetts, is a recent example of such an incident. In this incident, a rail car parked on a siding developed a leak that produced a cloud of hazardous vapor before the 200-gallon leak of hazardous materials was contained.

Local Government Officials Believe Some Shipments Stored in Transit May Violate a Rule to Expedite Shipments

Although they could not provide documentation to support their beliefs, local government officials we interviewed in two locations stated that they believed that, in some cases, shipments stored in transit in their local areas might be in violation of DOT's 48-hour rule[16] that generally requires a carrier to move each shipment of hazardous materials promptly and within 48 hours after its receipt at any yard, transfer station, or interchange point.

Although local officials believe the 48-hour rule is a safety and security standard for shipments of hazardous materials stored in transit, FRA officials told us that the 48-hour rule was not instituted for storage safety concerns. According to FRA officials, the 48-hour rule was implemented for economic reasons, not safety reasons. FRA officials said that the rule was developed in the early 1900s because oil companies were using rail yards as convenient storage warehouses and not promptly moving their shipments.[17] The rail companies did not want their property to be used as a storage warehouse without compensation. FRA officials said that they do not necessarily encourage rail companies to move rail cars affected by the 48-hour rule to another destination just to meet the time limit because this might result in moving a car from a safe to a hazardous location.

[16]49 CFR §174.14, *Movements To Be Expedited.*

[17]We were not able to corroborate FRA's explanation. What became the 48-hour requirement for expedited movement is found in the 1914 published rules of the Interstate Commerce Commission, *Regulations for the Transportation of Explosives and Other Dangerous Articles by Freight and Express and Specifications for Shipping Containers*, Interstate Commerce Commission, ¶¶ 1433, 1714, (GPO *eff.* October 1, 1914). The origin of the rules themselves can be traced from even earlier Interstate Commerce Commission rules, which grew out of the need to regulate the safe transportation of explosives. The 1914 regulations appear to have remained largely unchanged until 1939, when they were included in the first version of the Code of Federal Regulations. At that time, 49 C.F.R. § 80.262 (1939), provided:

"Movement to be expedited. Carriers must forward shipments of explosives and other dangerous articles promptly and within 48 hours after acceptance at originating point or receipt at any yard, transfer station, or interchange point."

FRA Is Beginning to Address Potential Safety and Security Issues Regarding Storage-in-transit

FRA officials recognize that the security concerns regarding storage-in-transit have grown since the September 11, 2001, terrorist attacks. From a security standpoint, the officials said that new regulations for storage-in-transit materials should be considered. According to these officials, such measures may include not allowing rail cars containing certain highly hazardous commodities to be stored in transit.

FRA is currently reviewing the safety and security of hazardous materials stored in transit through initiatives such as collaboration with the American Chemistry Council to examine how storage-in-transit shipments typically move, how the chemical industry can better expedite these movements, and viable alternatives to storing chemicals in transit. TSA is leading an initiative to follow chlorine shipments from origin to destination. Its overall goal is to determine best practices for shipments as well as the types of measures needed to secure shipments, including those stored in transit. TSA has reached out to the Chlorine Institute, American Chemistry Council, FRA, RSPA, and AAR. TSA hopes to expand the lessons learned from this initiative to other hazardous material rail shipments.

RSPA Plans to Clarify the Regulatory Oversight of the Safety and Security of Hazardous Materials Stored in Transit

In addition to expressing concern about the safety and security of hazardous materials stored in transit and their need for information on the types and quantities of these materials, a local official that we interviewed told us that he was unclear about which federal agency has regulatory oversight for the safety and security of this area. Some issues pertaining to the specific scope of DOT and EPA's roles in the regulatory oversight of hazardous materials stored in transit have not been fully determined. According to RSPA, confusion exists in the regulated community and among federal, state, and local agencies with hazardous material safety responsibilities regarding whether and to what extent DOT hazardous material transportation safety regulations apply to particular operations related to the transportation of hazardous materials in commerce, such as storage-in-transit on tracks leased to fixed facilities.[18]

[18]Leased tracks are railroad tracks in rail yards or railroad sidings that manufacturers, such as chemical companies, lease from railroad companies to temporarily store their commodities until needed. Commodities are stored in rail cars on these "leased" tracks. Leases may be "fixed," when a company enters into a lease of specific track, or "rolling," when the company pays a storage fee for whatever track the car may be sitting on. The location where the car is held may be the destination identified on the shipping papers but not the final destination where the hazardous materials will be unloaded. Fixed facilities are business premises where extremely hazardous materials are produced, stored, or used in amounts exceeding legally proscribed threshold quantities.

In response to requests for clarification on whether particular activities, such as storage-in-transit, should be considered transportation operations, RSPA has issued a proposed rule—Applicability of the Hazardous Materials Regulations to Loading, Unloading, and Storage, also known as HM-223—to clarify the applicability of DOT's hazardous material regulations to specific functions and activities, including loading and unloading of hazardous materials and their storage during transportation. RSPA officials have concluded that, given the potential for continuing terrorist threats and the critical need to assure the security of hazardous materials at fixed facilities and in transportation, it is more important than ever to clarify its jurisdiction over hazardous materials in transportation.

According to RSPA, confusion exists concerning whether EPA or DOT regulations apply to storage-in-transit on leased tracks because federal regulations do not clearly articulate whether this operation is transportation or nontransportation related. Under HM-223, RSPA is considering two options for regulatory oversight of storage-in-transit occurring on leased tracks. Under the first option, storage on leased tracks would be considered as storage after movement in transportation of the rail car has been completed whether the hazardous material is to be unloaded at that destination or not. The hazardous material transportation regulations would not apply under this option and hazardous material inspectors could not apply DOT's hazardous material rail safety requirements concerning proper shipping papers, operational handling of rail cars, or placards to indicate the hazardous content of rail cars.

According to EPA officials that we interviewed, under this option, EPA's risk management program regulations under the Clean Air Act might apply if storage on leased tracks contained more than a threshold amount of certain regulated highly toxic materials, such as chlorine. These officials note that EPA has stated that the Clean Air Act is not preempted by DOT's authority. They said that while EPA generally does not regulate activities regulated by DOT, there are circumstances where both agencies' authorities might apply, for example, with respect to long-term storage or facility equipment involved in loading or unloading.

Under the second option being considered, storage on leased tracks would be considered storage related to transportation and thus subject to all the applicable requirements of the DOT hazardous material regulation, even if the leased tracks were the final destination identified on the shipping papers. This would ensure that rail cars would be subject to all pertinent DOT hazardous material requirements.

While RSPA's efforts to propose rule making on the applicability of the hazardous material transportation regulations to loading, unloading, and storage of hazardous materials began with an advanced notice of public rule making in 1996, RSPA officials said that HM-223, which culminates those efforts, will be not be finalized until June 2003. Over this period, to address issues involved in clarifying jurisdiction in this area, RSPA published another advanced notice of public rule making in 1999 and held public meetings to obtain proposals and recommendations on the applicability of hazardous material regulations from the regulated community, which includes shippers, carriers, warehouses, and federal, state, and local public safety agencies. In 2001, RSPA published a notice of proposed rule making requesting written comments on proposals from these organizations.

Notifying Local Communities on the Type and Quantities of Hazardous Materials Stored in Transit Has Not Been Addressed

While chemical manufacturers are required to notify their communities of the existence of hazardous materials at their facilities, the advisability of requiring companies to notify local communities on the type and quantities of materials stored in transit has not been similarly addressed by DOT. Based on their observations, local officials from two of the 10 jurisdictions that we visited told us that they believe storage-in-transit shipments remain in rail yards for periods longer than 48 hours. To ensure adequate safety and security for hazardous materials stored in transit, the officials at one location suggested that the 48-hour rule be more strongly enforced to expedite shipments or, if hazardous material shipments remain stationary for extended periods of time (beyond the 48-hour period), these shipments should be regulated in a manner similar to hazardous materials stored in fixed facilities—with reporting requirements for companies to provide information to emergency response officials on the types and quantities of materials stored in transit.

The local officials said that, because these hazardous materials stored in transit are parked in their community for extended periods of time, they present a risk similar to the potential health and safety risk posed by chemicals at a fixed facility. They expressed a need to have information on the types and quantities of hazardous materials stored in transit in their communities to ensure that they have the proper training and equipment to respond to incidents involving these materials, and told us that they had experienced difficulty in obtaining information on these materials stored in transit. The local officials that we interviewed in one location feel that companies should be required to provide information on the contents of the rail cars in a manner similar to that required of fixed facilities under the Emergency Planning and Community Right-to-Know Act of 1986.[19] Under the requirements of this act, chemical manufacturers are required to notify their communities of the existence, as well as some routine and accidental releases, of hazardous materials at their facilities to aid in emergency planning.

While some local officials that we interviewed cited the need to receive information on the types and quantities of hazardous materials stored in transit, FRA officials told us that they were not in favor of sharing real-time data on these shipments. FRA officials said that it would be a significant logistical challenge for railroads to share real-time data regarding individual freight movements stored in transit. These officials said that providing advance notification information could also create new security concerns as detailed information on the whereabouts of hazardous materials becomes known in great detail by a large number of individuals. In addition, FRA officials commented that it would be inappropriate to require railroads to report to local communities on all hazardous materials stored in transit because the railroads have limited advance knowledge of what will be stored at these locations.

[19]P.L. 99-499.

Opinions Differ on Adequacy of Hazardous Material Shipment Information Provided to Communities, but No Determination Has Been Made on Appropriate Amount of Disclosure

While differing opinions exist concerning the adequacy of hazardous material shipment information currently provided to local communities, no determination has been made at a federal level on the appropriate amount of information rail companies should be required to provide to communities regarding overall hazardous material shipments to enhance their emergency preparedness. Officials from five of the ten communities that we visited said they did not need advance notification information on specific shipment types and quantities. Due to the high volume and variety of hazardous material shipments through his area, an official from one of these communities said that they employ an approach to respond to all types of chemical emergencies. He believes that this approach is more effective for his community's circumstances rather than trying to prepare for specific chemicals that might be involved in incidents. However, some officials from two of these five communities told us that they would like to receive advance notification of special shipments, such as high-level radioactive materials or explosives. Officials from the other five communities that we visited said that they would like to receive advance notification of certain shipments for emergency planning purposes.

AAR suggests to its member railroads that, as a voluntary policy, they provide, when requested, historical information on hazardous materials that have been shipped through a community. Officials from AAR member railroads that we interviewed said that they complied with this voluntary policy. For example, a railroad, when asked, will inform a community of the types of hazardous materials most frequently shipped through that community over the past year. This policy covers AAR member railroads, which account for more than 96 percent of intercity rail freight service and 100 percent of intercity passenger service in the United States.[20]

Emergency response officials that we spoke to at one of our site visits said that they had experienced difficulty in obtaining limited historical information about shipments of hazardous materials from a railroad that was not an AAR member. The local officials told us that it took 4 years of requests before the company agreed to provide this information to assist them in their emergency management planning. In the interim, the locality had to respond to a hazardous material incident on the company's tracks

[20]AAR's membership includes the major Class I railroads, two of the larger short line railroads, and 500 smaller railroads represented through an AAR operating committee.

involving a tank car leaking hydrochloric acid, which emergency responders were unaware had been stored on rail tracks in the community.

Officials that we spoke to from national rail industry organizations offered their opinions on the subject of advance notification. An official from one organization said that he does not support providing advance notification information on specific upcoming shipments to local communities because of the high volume of materials shipped and the low probability of release. An official from another organization said that his organization is not in favor of providing advance notification because it would be too much information sent on a daily basis and would soon be ignored. He further cautioned that releasing information about planned shipments could pose a security risk because such information could be used to identify vulnerabilities.

FRA officials told us that careful consideration needs to be given to the full implications of advance notification. They said that this includes security implications, community capability to make constructive use of the data, the potential costs and benefits of such requirements, and whether these requirements should be applied to other modes of transportation, such as motor carriers. Furthermore, in commenting on the overall consideration of new security measures for the rail industry, FRA officials told us that whatever security enhancements might be required for rail shipments of hazardous materials should be accompanied by appropriate security requirements for truck shipments so that shippers not switch to a potentially more vulnerable but less expensive alternative.

Most Localities Visited Report They Are Generally Prepared to Respond to Hazardous Material Rail Incidents, but Sufficiency of Actions Taken Cannot Be Determined

Even though a host of voluntary standards and self-assessment tools are available to assist localities in assessing aspects of their emergency response capabilities, no standardized tool currently exists to objectively determine a locality's level of preparedness to respond to hazardous material incidents. As such, the localities that we visited provided information on their preparedness based on their own self-assessments rather than on uniform national criteria. These localities took actions to prepare for and respond to hazardous material incidents based on self-assessments formed from a variety of factors. For the most part, these localities said that they found themselves prepared to respond to hazardous material rail incidents based on their own selected criteria. Due to the absence of a standardized tool to gauge the level of preparedness, we were unable to determine the sufficiency of local community actions to prepare for hazardous material rail incidents given the risk factors that they face.[21]

Case Study Findings Show Varying Preparedness Actions Taken by Local Communities

To assess local community capability to prepare for and respond to potential terrorist attacks or accidents involving rail shipments, we visited 10 localities in the United States. Each of these localities was judgmentally selected based on at least one of following three criteria:

- experienced a recent and significant rail incident involving hazardous materials,
- had a large population and flow of hazardous materials shipped through it by rail, and
- had a small population and large flow of hazardous materials shipped through it by rail.

Officials from most localities that we visited reported that their cities are generally prepared to respond to these incidents. Officials from the localities told us that they have emergency response plans in place, access to either their own or another hazardous material response team, and that they plan and conduct training and drills. In addition, these localities report

[21]Appendix V contains additional information on the federal government and private sector resources available to localities for emergency response to rail incidents involving the transportation of hazardous materials.

that they have most of the basic equipment necessary to respond to a hazardous material incident on hand. Although officials said they were generally prepared to respond to incidents involving hazardous chemical materials, they said that they were less prepared to deal with incidents involving radioactive materials, with some locations citing a lack of equipment and training needed to respond. Also, local officials that we interviewed said that technical communication compatibility could be improved, but they have developed ways to accommodate communication needs, such as the use of cellular phones. Finally, local officials from over half of the locations that we visited said that their communities lacked sufficient funds to cover the positions left temporarily vacant by personnel taking training.

Self-assessments Show That Most Locations Are Prepared to Respond to Hazardous Materials Incidents, but Not to Incidents Involving Radioactive Materials

Based on their own self-assessments, local fire department officials from most of the cities that we visited said that they are generally prepared to respond to a hazardous material incident. A few officials whom we interviewed said that although their city is prepared to respond to a hazardous material incident, their in-house capability would depend on the types of hazardous materials involved and the scope of the incident. For example, one fire department official said that he is comfortable with his city's capabilities to respond to chemical accidents such as leaking tank cars, spills, and derailments. He believed that his city could adequately respond to a hazardous material incident unless it was a catastrophic event, such as a major derailment involving multiple cars. This official stated, however, that in the event of a large-scale hazardous material incident, his city would use additional resources from private, state, and federal organizations, as well as mutual aid plans, where neighboring jurisdictions agree to provide emergency response resources to one another in the event that they are needed to augment their own response capabilities.

When asked if they were prepared to respond to a hazardous material incident involving radioactive materials, officials from most of the locations we visited said that they were less capable of responding to such incidents, with some locations citing a lack of equipment and training to respond. To prepare for the increase in spent nuclear fuel shipments expected with the proposed Yucca Mountain Repository, which is scheduled to begin operations in 2010, the federal government has begun preliminary planning to ensure local preparedness for the safe transport of spent nuclear fuel. If the Yucca Mountain Repository is licensed, DOE will be required, under the Nuclear Waste Policy Act of 1982,[22] to implement a program to train local public safety officials through whose jurisdictions DOE plans to ship radioactive materials to the repository. According to DOE, this program will be funded 5 years prior to the start of Yucca Mountain operations.

Emergency Response Plans Are in Place at All Locations

Emergency response plans are in place at all the localities we visited. These plans address all the hazards applicable to each location and include emergency responses to hazardous material incidents, including rail incidents. The plans vary according to the resources that each locality relies on and the specific courses of action each identifies to be taken in the event of an emergency. For example, the plans document which city agency is designated as a lead response agency in the event of an incident,[23] identify support agencies that can be called in, such as police and health departments, and outline civil defense procedures. Plans also vary on how often they are updated. In light of the September 11, 2001, terrorist attacks, officials from half of the locations we visited told us that they have incorporated new terrorism response procedures into their emergency planning, including training or response protocols.

[22]42 U.S.C. § 10175(c).

[23]For hazardous material incidents, a locality's fire department is the lead designated agency.

Most Cities We Visited Have Dedicated Hazardous Material Teams and All Have Access to Public Hazardous Material Teams

More than half of the cities we visited have their own dedicated hazardous material teams to respond to incidents involving the release of hazardous materials, including those occurring at fixed facilities or in rail transportation. These are all large or medium-sized cities.[24] Cities that do not have their own hazardous material teams have access to a local, regional, state, or private hazardous material response team. For example, an official from one small city said that the city has access to the resources of the state police hazardous material team. As part of their emergency response plans, other cities have access to chemists from private industry or universities to provide technical assistance in identifying chemicals and their hazards in the event of an incident.

All Fire Department Personnel Have at Least Some Hazardous Material Response Training

Local fire department officials that we interviewed in all the locations we visited said that their fire department personnel have received at least awareness-level training, the lowest level of training recommended in National Fire Protection Association (NFPA) Standard 472, *Professional Competence of Responders to Hazardous Materials Incidents*. However, a representative of a national emergency response organization suggested that the minimum level of training for first responders should actually be at the operations level, the second highest level of training described in NFPA Standard 472. Fire departments in the locations we visited varied in providing operations level training for their fire fighting personnel. However, for the locations with specialized hazardous material teams, all hazardous material team personnel received technician level training, the third highest level of training recommended by NFPA Standard 472. Table 1 lists the four levels of training recommended by NFPA Standard 472.

[24]We defined a small city as one having a population of less than 100,000 people, a medium-sized city as one having a population between 100,000 and 500,000 people, and a large city as one having a population of over 500,000 people. The population figures are based on the 2000 U.S. Census.

Table 1: NFPA Levels of Professional Competence for First Responders to Hazardous Materials Incidents

Level	Definition
Awareness	The basic competency developed by the NFPA for first responders to a hazardous materials incident. The training includes providing first responders with the knowledge and skills to identify a hazardous materials incident and to contact the appropriate response resource in accordance with local standard operating procedures.
Operational	The second level of competency developed by the NFPA for first responders to hazardous materials incidents. First responders trained at this level will meet the competency of the NFPA's awareness level training as well as any additional competency designed to allow the responder to plan and initiate a response to the incident.
Technician	The third level of competency developed by the NFPA for first responders to hazardous materials incidents. First responders trained at this level will meet the competency of the NFPA's awareness and operational standards. Additional training includes appropriate measures to meet federal and other state, local, or provincial occupation health and safety regulator requirements.
Incident Commander	The highest level of competency developed by the NFPA for first responders to hazardous materials incidents. First responders trained at this level will meet all NFPA standards for awareness and operational levels. In addition, responders trained at the command level will have the necessary knowledge to analyze a hazardous material incident and plan for and mitigate incidents.

Source: National Fire Protection Association. Reprinted with permission from NFPA 472-2002, *Professional Competence of Responders to Hazardous Materials Incidents*, Copyright © 2002, National Fire Protection Association, Quincy, MA 02269.

Note: This reprinted material is not the complete and official position of the NFPA on the referenced subject, which is represented only by the standard in its entirety.

In addition to fire departments, officials in some cities we visited told us that they have trained other departmental personnel, such as police, health, and public works, for response to hazardous material incidents. The officials we interviewed said that, while these other agencies are not expected to serve a primary role in the containment of hazardous material incidents, this training familiarizes these personnel with response procedures in the event that they are the first on the scene to an incident or are required to assist responding fire fighters, such as by rerouting traffic.

More Than Half of The Cities We Visited Have Conducted Hazardous Material Response Drills and Cited Lessons Learned

Officials from more than half of the case study locations that we visited said that they conducted response drills to prepare for hazardous material incidents. These cities have had at least one hazardous material drill within the last 3 years. Officials from some cities said that they have conducted rail-specific hazardous material response drills.

Among the cities that have conducted drills or experienced prior hazardous material rail accidents, officials told us that these experiences had highlighted the need for

- better communication and coordination, including the use of the incident command system, among departments or mutual aid districts during an emergency;
- joint training;
- better dissemination of information to the public including better public awareness of civil defense procedures; and
- better crowd control in a mass decontamination situation.

Equipment Is Lacking in Some Locations

In addition to a firefighter's standard turnout gear, several pieces of equipment are commonly used to respond to hazardous material incidents.[25] These include airborne chemical detection equipment, spare turnout gear, protective gear, air hazard detection equipment, and chemical identification kits.

While officials that we interviewed said that they have the majority of this equipment on hand to use in response to a hazardous material incident, some locations said they lacked some additional equipment that was not on this list, such as patient extraction equipment and hazardous material response vehicles to carry equipment to the scene. More than half the locations specifically cited a need for additional radiological response equipment, such as detectors, decontamination equipment, and personal protective equipment.

Compatibility of Communication Equipment Varies by Location

Officials in half of the case study locations we visited told us that communication systems are not compatible between city agencies. In addition, officials in most of the case study locations we visited said that they could not communicate with other jurisdictions without the use of an intermediary communication device, such as a dispatch center. While officials we interviewed said that communication compatibility could be improved, most said that they have developed ways to accommodate communication needs, such as the use of cellular phones. However, in one location that had experienced a recent rail accident involving hazardous materials, officials cited radio communication incompatibility as a problem. These local officials said that they did not have the compatibility

[25]Typically, a firefighter's standard turnout gear includes a helmet, coat, gloves, pants, boots, and a self-contained breathing apparatus, which provides the user with respiratory protection in a toxic or oxygen deficient environment.

to speak by radio to officials from other agencies outside the city. Officials from some case study locations also told us that communication systems do not work as well underground.

Officials Said That Training Can Be Difficult to Access Because of Personnel Funding Constraints

Officials from over half of the case study locations we visited said that they had difficulty accessing hazardous material response training opportunities because of the cost of providing replacements for those first responders taking training. In addition, one national response organization stated it visits localities to provide training to help alleviate costs that may be associated with travel to off-site training courses.

DHS' Directorate of Emergency Preparedness and Response Is Beginning Work on a Baseline Assessment Tool to Determine Preparedness Levels

With the development of a national homeland security strategy, DHS' EP&R Directorate has also recognized a need for the federal government to conduct an assessment of state emergency response preparedness levels that would allow it to determine a baseline to measure preparedness across the country. Since most local emergency response standards and procedures are voluntary in nature and states employ a wide variety of guides in their planning, the EP&R Directorate chose to adopt one of these assessment tools—the Emergency Management Accreditation Program (EMAP) criteria—to standardize the data collection process and help the agency ascertain factors in vulnerabilities on a national level. EP&R Directorate officials characterized EMAP standards as being very rigorous.

In fiscal year 2003, as a first step toward developing a preparedness baseline, EP&R Directorate officials plan to request that all 50 states complete a self-assessment of their level of preparedness to respond to emergencies using EMAP standards as a guide. From the assessment program, EP&R Directorate officials said that they hope that communities evaluate their own capabilities, identify deficits, and establish performance standards to improve emergency response. EP&R Directorate officials also plan to work with a team of EMAP peer reviewers to validate the operability of state emergency response plans as an additional tool in gauging preparedness. This information would then be used to determine the EP&R Directorate's baseline of national preparedness levels.

To validate state emergency response planning, the EP&R Directorate plans to train assessment teams to evaluate preparedness using a common methodology. These teams would spend from 3 to 8 days evaluating each state. Their methodology would include checks of state emergency plan resources. For example, if a certain organization within a state is expected to provide a specific resource or serve a role in the plan, the reviewers

would contact that organization and verify that the resource contacts know what is expected of them and can perform the tasks. EP&R Directorate officials said that assessments of all states are due to be completed by the end of 2004. The EP&R Directorate plans on assessing about half the states annually in this program and issuing a midprogram assessment report.

Conclusions

The terrorist attacks of September 11, 2001, have focused attention on the security and potential vulnerabilities of the nation's transportation infrastructure. In response to heightened awareness, the railroad industry took action to develop a security plan using a risk management approach to address perceived vulnerabilities. The adequacy of this industry plan to protect communities and the railroad infrastructure is still unclear since TSA, which is responsible for the security of all modes of transportation, including rail, has not yet developed a plan to specifically address the security of rail transportation, even though it has started developing a risk-based intermodal transportation system security plan. Without such a specific plan, TSA lacks a framework for systematically evaluating and prioritizing actions needed to ensure the safety and security of the transportation of hazardous materials by rail.

Some of the communities that participated in our case studies expressed concerns regarding the safety and security of hazardous materials in rail cars passing through or stored in their communities. They wanted additional information on the types and quantities of these materials since, without this information, it is difficult for communities to know how to prepare for possible incidents involving hazardous releases. However, this need for information must be balanced against the security risks that disclosure could pose.

Recommendation for Executive Action

To help meet the requirement to secure all modes of transportation under the Aviation and Transportation Security Act, we recommend that the Secretary of Homeland Security work jointly with the Secretary of Transportation to develop a risk-based plan that specifically addresses the security of the nation's rail infrastructure. This plan should build upon the railroad industry's experience with rail infrastructure and the transportation of hazardous materials and establish time frames for implementing specific security actions necessary to protect hazardous material rail shipments. Among the areas that should be addressed in developing this plan are

- the appropriate roles of the private sector and federal, state, and local governments;
- minimum security standards for hazardous materials stored in transit in rail cars; and
- the appropriate level of disclosure to local communities of the types and quantities of hazardous materials passing through or stored in transit in these communities.

Agency Comments and Our Evaluation

We provided the Departments of Defense, Energy, Health and Human Services, Homeland Security, Justice, Labor, and Transportation, as well as the Environmental Protection Agency, National Transportation Safety Board, and Nuclear Regulatory Commission, with copies of a draft of this report for their review and comment. The Departments of Defense, Justice, and Labor, as well as the National Transportation Safety Board, did not provide comments. The Departments of Health and Human Services and Energy, as well as the Environmental Protection Agency and Nuclear Regulatory Commission, provided technical comments and generally agreed with our report. The Departments of Transportation and Homeland Security provided oral comments. They generally agreed with our report and acknowledged that no plan to specifically address rail security has been developed, but stressed that they have taken some actions to enhance the security of hazardous material rail shipments. We incorporated these comments where appropriate. In addition, the Department of Transportation raised other issues regarding rail security, which are discussed below.

The Administrator of FRA commented that our report gave the impression that, in the absence of explicit federal security requirements, railroad companies were paying insufficient attention to security risks. This was not our intention. Rather, our report credits the timely effort to address rail hazardous material risk by the Association of American Railroads, which was performed with a number of chemical manufacturers. It further lists security measures reported by individual railroads in the aftermath of September 11, 2001.

FRA officials said that a risk-based management approach to rail security would circumvent the regulatory cost-benefit approach. We believe that a risk-based approach can provide organizations with a process for enhancing their preparedness to respond to terrorist attacks and to permit

better direction of finite national resources to areas of highest priority, which should be consistent with a cost-benefit assessment. As we stated in the report, such an approach is consistent with recommendations we have made in our previous work on homeland security. It is also consistent with the risk management process outlined by the President's National Strategy for the Physical Protection of Critical Infrastructures and Key Assets.

FRA officials also commented that the safety risks associated with the storage-in-transit of hazardous materials received inappropriate emphasis in the report, suggesting that the concern is based only on anecdotal information. We did not attempt to define the magnitude of the safety risks associated with storage-in-transit. Rather, we reported the concerns expressed by some local communities about this practice without attempting to determine the extent of the problem at a national level.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to the agencies listed above. We also will make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at http://www.gao.gov.

If you have any questions about this report, please contact me at (202) 512-2834. Individuals making key contributions to this report included Colin J. Fallon, Bert Japikse, Jane S. Kim, Victoria E. Miller, John W. Mingus Jr., Thomas M. Phan, Maria J. Santos, Michael J. Simon, and Robert E. White.

Peter F. Guerrero
Director
Physical Infrastructure Issues

Scope and Methodology

We used a combination of approaches and methodologies to examine (1) recent steps taken by industry and government to improve the safety and security of hazardous materials transported by rail, (2) issues pertaining to the safety and security of rail transport of hazardous materials that, in the opinion of the hazardous material experts, remain unresolved, and (3) the preparedness of local jurisdictions to respond to rail incidents involving hazardous materials. We completed interviews with regulatory officials and representatives of private industry, analyses of hazardous material volume and incident data, and case study interviews with local officials.

To obtain the views of experts on the safety and security of rail transportation of hazardous materials, we sponsored a 1-day panel through the National Academy of Sciences that brought together representatives from academia, industry, and local government. The views of panel members were used to identify issues and perspectives on the current system, policies, and practices for transporting hazardous materials by rail. Specifically, we asked the panel members to discuss their opinions on: (1) the effectiveness of current industry policies for the safe and secure shipment of hazardous materials by rail, (2) the effectiveness of current federal regulatory and assistance programs, and (3) suggestions for improved industry and government cooperation. Their views served to support our identification of issues that still remain to be addressed in ensuring the safety and security of hazardous materials shipped by rail.

We did our work at 10 federal agencies, several private organizations representing the railroad and chemical industries and emergency responders, private rail companies, and state and local government agencies in 10 locations nationwide. A complete list of the agencies and organizations visited and contacted follows. We do not list the local community case study locations that we visited because of the sensitive nature of our review in light of homeland security concerns.

Organizations Visited and Contacted

Cabinet Departments

- Department of Defense, Washington, D.C.; and Fort Eustis, Virginia
- Department of Energy, Washington, D.C.; and Albuquerque, New Mexico

- Department of Health and Human Services, Washington, D.C.
- Department of Homeland Security (including the Transportation Security Administration, U.S. Coast Guard, Directorate of Emergency Preparedness and Response), Washington, D.C.
- Department of Justice, Washington, D.C.
- Department of Transportation (including the Federal Railroad Administration and the Research and Special Programs Administration), Washington, D.C.
- Department of Labor, Washington, D.C.

Other Agencies

- Environmental Protection Agency, Washington D.C.
- National Transportation Safety Board, Washington, D.C.
- Nuclear Regulatory Commission, Rockville, Maryland

National Organizations

- International Association of Chiefs of Police, Alexandria, Virginia
- International Association of Emergency Managers, Falls Church, Virginia
- International Association of Fire Chiefs, Fairfax, Virginia
- International Association of Fire Fighters, Washington, D.C.
- National Emergency Management Association, Lexington, Kentucky
- National Volunteer Fire Council, Washington, D.C.

Private Sector

- American Chemistry Council, Arlington, Virginia
- Association of American Railroads, Washington, D.C.

- American Short Line and Regional Railroad Association, Washington, D.C.
- American Petroleum Institute, Washington, D.C.
- The Chlorine Institute, Washington, D.C.
- Dangerous Goods Advisory Council, Washington, D.C.
- CSX Transportation, various locations
- Burlington Northern-Santa Fe Railroad, various locations
- Union Pacific Railroad, various locations.

To examine the current safety and security infrastructure of the rail industry, we conducted a series of interviews with agency officials, local first responders, railroad companies, and industry and trade groups. We then examined supporting documentation from these interviews, Department of Transportation databases, federal laws and regulations, and previous GAO findings. We also conducted site visits of rail facilities to record observations about security and safety practices.

To report on local jurisdictions' capability to respond to potential terrorist attacks or chemical accidents, we performed case studies of 10 localities in the United States. We judgmentally selected two small cities, four medium-sized cities, and four large cities. The localities met at least one of following three criteria:

- had experienced a recent and significant rail incident involving hazardous materials,
- had a large population and flow of hazardous materials shipped through it by rail, and/or
- had a small population and large flow of hazardous materials shipped through it by rail.

We obtained locations of recent and significant hazardous material incidents by researching available reports and information from the National Transportation Safety Board. We analyzed the Surface Transportation Board's carload Waybill Sample, an annual stratified sample

of national rail flows within the United States, to determine flows of hazardous materials by rail.[1] To estimate carload and tonnage data, we also used the Waybill Sample. We analyzed the waybill origin and destination data using the Department of Energy's Transportation Routing Analysis Geographic Information System to identify localities with a high level of hazardous material flows. We reviewed documentation provided with the waybill sample and the data we received from the sample, and determined that these data were sufficiently accurate for our purposes.

To obtain information about our case study localities and their preparedness to respond to incidents involving rail transportation of hazardous materials, we interviewed officials from city government agencies such as the fire, police, public works, transportation, emergency management, and public health departments. We also interviewed local emergency planning committees and state environmental and emergency response agencies. In addition, we obtained and examined supporting documentation from interviews with local officials as part of the study. As discussed in the report, no standardized tool exists to gauge the preparedness of a community for a hazardous material incident.

The report encompasses all aspects of rail transport of hazardous materials, including loading, unloading, and storage, as well as the time these materials spend in motion. This report uses the definition of hazardous materials in federal hazardous material transportation law, which includes flammable and radioactive materials.[2] Although some hazardous materials enter the United States overland by rail from Canada and Mexico, this report does not address issues that may be associated with international shipments. Further, this report does not directly address issues associated with computer security and possible cyber attacks.

[1]The Waybill Sample is a stratified random 1 percent sample of waybills prepared by railroads. This sample is stratified by the collection method (electronic vs. hardcopy) and number of carloads included in a given waybill. Because the Surface Transportation Board has different sampling rates for each stratum, each stratum has its own weight. These weights are applied to the sample calculations of carloads and tonnage to estimate population values.

[2]The Hazardous Materials Transportation Act, 49 U.S.C. § 5103(a), defines a hazardous material as a substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce. It includes hazardous substances, hazardous wastes, marine pollutants, and elevated temperature materials.

Oversight of Rail Shipments of Hazardous Materials by the Department of Transportation and Other Federal Agencies

In addition to the Department of Transportation (DOT), several federal agencies have authority over certain aspects of rail shipments of hazardous materials. These include the Department of Homeland Security (DHS), Environmental Protection Agency (EPA), Department of Labor's Occupational Safety and Health Administration (OSHA), Nuclear Regulatory Commission (NRC), Department of Energy (DOE), and Department of Defense (DOD).

DOT and DHS Oversee Rail Safety and Security

Two administrations within DOT—the Research and Special Programs Administration (RSPA) and Federal Railroad Administration (FRA)—have responsibilities for developing regulations pertaining to the transportation of hazardous materials and rail safety. Under the Homeland Security Act of 2002, the Department of Transportation shares responsibility with the Transportation Security Administration, within DHS, for rail security.[1]

RSPA is responsible for discharging the responsibilities of the Secretary of Transportation under federal hazardous material transportation law to identify and regulate the transportation of materials that may pose an unreasonable risk to health, safety, and property when transported in commerce. RSPA develops hazardous material regulations, coordinating its work with other DOT administrations, including FRA. These regulations specify how shipments must be identified, packaged, and handled in transit. RSPA also sets hazardous material transportation training requirements, helps enforce the hazardous material regulations, and funds hazardous material emergency preparedness grants to assist localities. RSPA has the authority to pursue civil and criminal penalties for deliberate violations of hazardous material transportation regulations, focusing primarily on packaging standards and shippers of hazardous materials. According to RSPA officials, RSPA conducts some, but not many, radioactive material inspections.

FRA oversees the safety of track, signal and train controls, motive power and equipment, operating practices, highway-rail grade crossing safety, and hazardous materials. To ensure compliance with railroad safety regulations, FRA conducts thousands of inspections annually in these six

[1]The Homeland Security Act of 2002 (P.L. 107-296), § 1711(a)(1) and (2) directed the Secretary of Transportation to regulate transportation security and safety (49 U.S.C. 5103), and § 1711(a)(3) and (b)(1) through (3) of the act directed the Secretary of Homeland Security to issue transportation security regulations.

areas. FRA has several enforcement tools, such as civil and criminal penalties, if railroad companies do not comply with safety regulations.

For the shipment of spent nuclear fuel and high-level radioactive materials, FRA has developed a safety compliance and oversight plan to examine the safety and security of prospective shipping routes, rail crews, and equipment prior to shipment of these materials and to provide an additional level of inspection for such shipments. To ensure the safety and security of these shipments, FRA performs several procedures such as inspections of rail cars and locomotives and coordination with federal intelligence and local law enforcement agencies to identify where shipments could be stored temporarily en route if needed. FRA, in conjunction with the Association of American Railroads, DOE, and rail representatives, is updating its safety compliance and oversight plan to address security concerns related to terrorism.

Within DHS, TSA, created in the immediate aftermath of the terrorist attacks of September 11, 2001, has focused primarily on aviation issues, but it is responsible for the security of all modes of transportation, including rail. Though originally a part of DOT, TSA became a part of DHS, along with 22 other agencies in an effort to better coordinate the federal government's resources to prevent and protect the United States from domestic terrorism. In addition, the U.S. Coast Guard has the responsibility for preventing spills from vessels and waterfront facilities. The Coast Guard also serves as the federal on scene coordinator under the National Contingency Plan for oil or hazardous substance releases in the coastal zone.

EPA Oversees Fixed Facilities That Handle Hazardous Materials

EPA has authority for implementing and enforcing legislation governing the protection of public health and the environment against chemical and other polluting discharges and for abating and controlling pollution when spills occur. The regulatory focus of EPA's Chemical Emergency Preparedness and Prevention Office is on fixed facilities, such as chemical factories, that handle large quantities of hazardous materials. Under the Emergency Planning and Community Right-to-Know Act of 1986,[2] EPA helps coordinate preparedness among federal, state, and local emergency responders. The purpose of this act is to encourage and provide support for

[2]P.L. 99-499.

emergency planning efforts at the state and local levels and provide the public and local governments information concerning potential chemical hazards present in their communities. As part of its responsibilities under this act, EPA identifies substances and quantities that qualify as extremely hazardous. EPA has also provided training and technical assistance to states and localities to enhance contingency planning and emergency response capabilities. Under the Clean Air Act,[3] as amended, EPA implements a risk management program that requires stationary chemical facilities to prevent and mitigate accidental releases of extremely hazardous chemicals. EPA also has responsibilities concerning oil spills. EPA's Office of Air and Radiation sometimes participates with other agencies in responding to hazardous material transportation incidents involving radioactive materials.

OSHA Focuses on the Safety of Plant Workers and Emergency Responders

The Occupational Safety and Health Act, administered by OSHA, requires employers, including chemical and railroad companies, to provide safe workplaces. It requires that OSHA promulgate standards to protect the safety and health of employees. Additionally, the statute and implementing regulations require employers to, among other things, inform employees about potential hazards, provide safety training, keep records of workplace injuries, notify government administrators of serious accidents, and post notices informing workers about their rights to complain about safety and health violations. OSHA establishes hazardous material training and safety requirements for emergency responders through its general industry standards, including its hazardous waste operations and emergency response standard.

NRC and DOE Oversee Shipments of Nuclear Material

Although DOT regulates the transportation of nuclear material, including spent fuel, as hazardous material, NRC also regulates the transportation of nuclear material by its licensees. The primary role of NRC, under a memorandum of agreement with DOT, is the establishment of packaging standards for fissile materials and for other radioactive materials exceeding certain limits. NRC certifies spent fuel casks and other radioactive material package designs that meet these standards and requires its licensees to use certified casks for transport. NRC also plays a

[3] P.L. 84-159.

significant role through safety and security requirements and through inspection and enforcement.

The responsibilities of DOE regarding spent nuclear fuel are related to its role as an operator of nuclear facilities, including its role in developing the proposed Yucca Mountain Repository. DOE's Office of Civilian Radioactive Waste Management is responsible for shipping spent nuclear fuel and oversees nuclear waste fund activities related to the Yucca Mountain Repository, which include the transportation of spent nuclear fuel. The shipping is done in accordance with NRC packaging and advance notification requirements and DOT's hazardous material regulations. Both DOE and NRC have authority to approve packages, such as casks as suitable for transport under the hazardous material regulations, NRC's rule for the packaging and transportation of radioactive material,[4] and the Atomic Energy Act of 1954, as amended.[5] DOE's authority is for defense or DOE-owned materials, while NRC's authority is for shipments by its licensees. In addition, DOE's Office of Environmental Management coordinates policies and program implementation for shipments of environmental radioactive waste for DOE, coordinating its operations with DOT. NRC also performs inspections to determine whether companies that transport radiological materials take appropriate safety measures to package these materials. For the transportation of spent nuclear fuel, NRC performs inspections of shipments by its licensees to ensure that this material is physically protected against acts of sabotage.

DOD Oversees the Safety and Security of Military Hazardous Material Shipments

DOD's Military Traffic Management Command, which oversees the shipments of DOD hazardous materials by rail companies and ensures that they are shipped according to DOD's safety and security standards, requires that everyone participating in the shipment of hazardous materials comply with the hazardous material regulations. This includes compliance with requirements for labeling, placarding, and transportation. DOD also requires inspections for sensitive shipments, including hazardous materials, to be conducted by railroad police officers, trained railroad employees, or members of private security firms under contract to DOD.

[4] 10 C.F.R. 71.

[5] P.L. 83-703.

Annual Hazardous Material Rail Shipments in the United States

Millions of tons of hazardous materials are shipped yearly on a 170,000-mile rail network that crisscrosses the continental United States. The Class I railroads, the largest of the railroad companies, operate more than 120,000 miles of this road.[1] The rail network touches every major urban center and hundreds of smaller communities in between. While the vast majority of shipments arrive safely at their destination, serious incidents involving these materials have the potential to cause widespread disruption or injury. In July 2001, the derailment of a CSX Transportation train in an underground tunnel and the ensuing fire fueled by hazardous materials disrupted the city of Baltimore, Maryland, for several days. In January 2002, a Canadian Pacific Railway derailment outside Minot, North Dakota, ruptured seven tank cars carrying anhydrous ammonia, creating a vapor plume approximately 5 miles long and 2 ½ miles wide. The hazardous material release affected approximately 15,000 people, causing one death and more than 300 injuries.

Department of Transportation Categorizes Hazardous Materials by Nine Classes

The Department of Transportation's (DOT) hazardous material regulations classify hazardous materials into nine hazard classes. Among other things, the classification system helps communicate the hazards of these materials to emergency responders and transportation workers. The nine classes of hazardous materials are

- Class 1, explosives;
- Class 2, gases;
- Class 3, flammable liquids;
- Class 4, flammable and solids;
- Class 5, oxidizing substances and organic peroxides;
- Class 6, poisonous and infectious substances;
- Class 7, radioactive materials;

[1]DOT's Surface Transportation Board designates three classes of freight railroads based on annual operating revenues. Class I railroads are the largest of these, with annual operating revenues of $261.9 million or more (in 2000 dollars). Class II and III railroads are defined by their revenues, but are often referred to as regional, short line, or switching railroads.

- Class 8, corrosives; and
- Class 9, miscellaneous materials.

Some of these nine classes are further divided into subclasses to denote different hazards. For example, Class 2 is divided into three divisions: 2.1, flammable gases; 2.2, nonflammable, nonpoisonous compressed gases; and 2.3, poison gases. Any hazardous materials that are properly packaged and labeled and suitable for transportation by rail are eligible for shipment on any class of railroad track.

Overall Volume of Rail Shipments of Hazardous Materials for Rail, Truck, and Water are Similar by Ton-mile

DOT estimates that there are over 800,000 shipments of hazardous materials daily by all modes of transportation in quantities varying from several ounces to many thousands of gallons. For comprehensive data related to flows of hazardous materials for all modes of transportation, DOT and the Department of Commerce jointly conduct the Commodity Flow Survey (CFS). To examine the flow across modes, we used data from the 1997 CFS, the most recently completed survey. We reviewed the published methodology and determined that the data were sufficiently accurate for our purposes.

The 1997 CFS data, shown in table 2, estimated that approximately 97 million tons of hazardous materials were shipped by rail during that year, fourth among all modes behind truck, water, and pipeline. However, rail-transported commodities travel a far greater average distance, with the result that the shipments by ton-mile for rail, truck, and water are similar.

Table 2: 1997 Hazardous Materials Shipped by Tons and Ton-miles

Mode	Tons (thousands)	Percent[a]	Ton-miles (millions)	Percent[a]
All modes	1,565,196	100%	263,809	100%
Truck	869,796	56%	74,939	28%
Rail	96,626	6%	71,711	27%
Water	143,152	9%	68,212	26%
Air (includes truck and air)	66	<1%	95	<1%
Pipeline[b]	432,075	28%	N/A	N/A
Multiple modes	6,022	<1%	3,061	1%
Other and unknown	17,459	2%	1,837	1%

Legend

N/A = These estimates were not published in the CFS because they did not meet publication standards due to high sampling variability or other reasons. Some unpublished estimates can be derived from other data published in this table. However, figures obtained in this manner are subject to these same limitations.

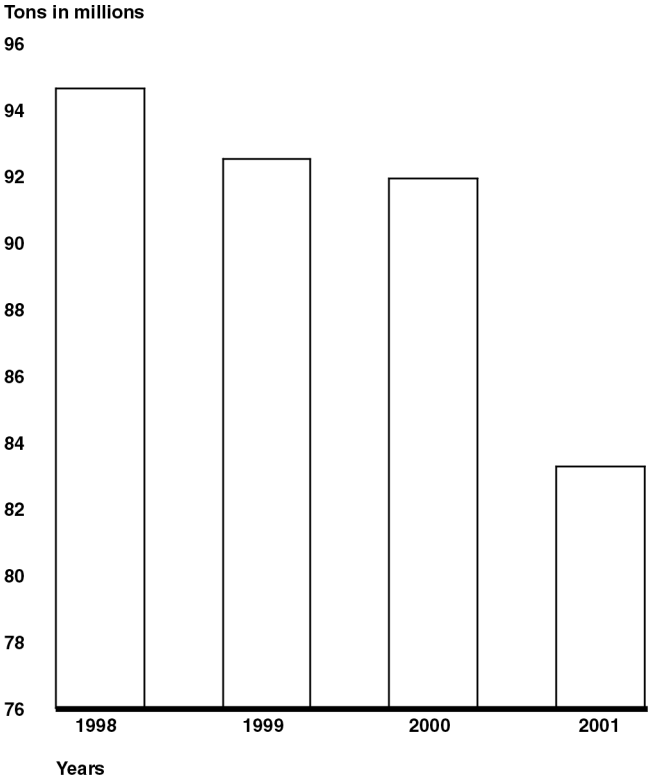
Sources: GAO analysis of DOT and Department of Commerce data.

[a]Percent figures may not add exactly due to rounding.

[b]CFS data exclude most shipments of crude oil.

While the 1997 CFS provides the most recent comprehensive data across modes, total tonnage shipped on rail can also be obtained through analysis of Waybill Sample data. Figure 3 shows tons of hazardous materials shipped by rail for 1998-2001 based on Waybill Sample data.

Figure 3: Tons of Hazardous Materials Shipped by Rail, 1998–2001



Source: GAO analysis of DOT data.

Note: Estimates from the Waybill Sample have sampling errors associated with them. The 95 percent confidence level associated with the 1998 estimate of approximately 95 million tons ranges from approximately 93 million tons to approximately 97 million tons. Except as noted in the text, all percentage estimates have sampling errors not exceeding plus or minus 5 percentage points, and all numerical estimates other than percentages have sampling errors not exceeding 5 percent of the value of those estimates.

Rail Shipments Represent a Much Higher Share of Volume for Some Hazardous Material Classes

When data from the 1997 CFS is examined according to hazard classes and across transportation modes, it becomes clear that, despite accounting for only 6 percent of the overall hazardous material tonnage and 27 percent of ton-miles, rail has a much higher share for other hazard classes for which data are available. The reason for this divergence is the predominance of flammable liquids, such as gasoline and diesel fuel, in hazardous material shipments.[2] When the commodities are looked at individually, the large role that rail plays in shipping other hazardous materials becomes apparent. For example, rail moves 55 percent of Class 4, flammable solids, and 31 percent of Class 6, toxic materials.

If volume data are further separated by division within hazard class, the prevalence of rail as a shipment mode for some specific subcategories of materials comes into even sharper focus. For example, as shown in table 3, 59 percent of the tonnage of toxic-by-inhalation gases moves by rail, representing 95 percent of the ton-miles of these gases.

[2]Flammable liquids are approximately 81 percent of all hazardous materials shipped, about 2 percent of which are transported by rail.

Table 3: Rail Shipments as Percentage of Hazardous Material Shipments by All Transportation Modes by Hazard Class and Division, 1997

Class[a]	Division	Hazard division[a]	Tons (thousands)	Tons (percent)	Ton-miles (millions)	Ton-miles (percent)
1-Explosives			N/A	N/A	N/A	N/A
	1.1	Explosives with a mass explosion hazard	N/A	N/A	N/A	N/A
	1.2	Explosives with a projection hazard	< 1	< 1%	< 1	< 1%
	1.3	Explosives with predominantly a fire hazard	< 1	< 1%	< 1	< 1%
	1.4	Explosives with no significant blast hazard	N/A	N/A	N/A	N/A
	1.5	Very insensitive explosives, blasting agents	< 1	< 1%	< 1	< 1%
2-Gases			15,203	13%	11,447	52%
	2.1	Flammable gases	6,362	10%	4,671	50%
	2.2	Nonflammable, nontoxic compressed gases	3,075	8%	1,836	25%
	2.3	Gases toxic by inhalation	5,766	59%	4,940	95%
3-Flammable liquids			26,642	2%	19,548	12%
4-Flammable solids			6,477	55%	8,639	90%
	4.1	Flammable solids	5,904	58%	7,815	93%
	4.2	Spontaneously combustible materials	390	46%	613	82%
	4.3	Dangerous when wet materials	183	22%	211	50%
5-Oxidizers and organic peroxides			3,182	34%	2,820	63%
6-Toxic (poison)			1,949	31%	1,446	51%
7-Radioactive materials			N/A	N/A	N/A	N/A
8-Corrosive materials			24,427	27%	16,998	41%
9-Miscellaneous dangerous goods			18,334	28%	13,064	58%
Total			**96,626**	**6%**	**74,711**	**28%**

Legend

N/A = Data do not meet publication standards because of high sampling variability or other reasons.

Source: GAO analysis of DOT data.

[a]The 1997 CFS uses different names for hazard classes than DOT currently uses.

Poisonous Inhalation Hazardous Materials Were Among the Ten Most Commonly Shipped Hazardous Materials from 1998 to 2001

The quantities of specific chemicals shipped by rail can be determined by analyzing the Waybill Sample data. Table 4 shows the top 20 materials shipped by rail from 1998 to 2001 and the average number of carloads shipped annually during this period. Nonbulk cargoes such as freight forwarder traffic and freight rate shipments, both of which may consist of mixed materials, were the top two types of hazardous materials shipped. The top bulk hazardous material cargoes can be in the form of solids, liquids, or liquefied gases, and include flammable, corrosive, and toxic hazardous materials. Poison-by-inhalation hazardous materials, such as ammonia and chlorine, are in the top 10 carloads shipped for this time period.

Table 4: The Top 20 Hazardous Materials Shipped by Rail by Volume, 1998–2001

Hazardous materials	Estimated total carloads[a]	Estimated average annual number of carloads
1. Freight forwarder traffic[b]	1,188,109	297,027
2. All freight rate shipments, not elsewhere coded (NEC), or trailer on flat car shipments, commercial, except where identified by commodity	716,177	179,044
3. Sulfur liquid or molten nonmetallic minerals except fuels	273,005	68,251
4. Liquefied petroleum gas, NEC, compressed	253,234	63,308
5. Sodium (soda), caustic (sodium hydroxide)	236,455	59,114
6. Asphalt pitches or tars, from petroleum, coal tar, coke oven, or natural gas	222,163	55,541
7. Sulfuric acid or oil of vitriol	200,875	50,219
8. Ammonia, anhydrous	163,057	40,764
9. Chlorine gas, liquefied	128,600	32,150
10. Gasolines, blended, consisting of motor fuels containing 50% or more of gasolines[c]	97,192	24,298
11. Ethyl alcohol, anhydrous denatured in part with petroleum products and/or chemicals (not to exceed 5%)	95,333	23,833
12. Phosphatic fertilizer solution, containing not more than 77% of phosphoric anhydride by weight	90,779	22,695
13. Chemicals, NEC	86,854	21,713
14. Vinyl chloride (chloroethane or chloroethylene)	73,033	18,258
15. Methanol (methyl or wood alcohol) liquid	67,903	16,976
16. Propane gas, liquefied	65,702	16,425
17. Carbon dioxide gas, liquefied, or carbonic acid gas	63,020	15,755
18. Ammonium nitrate fertilizer	62,563	15,641

(Continued From Previous Page)

Hazardous materials	Estimated total carloads[a]	Estimated average annual number of carloads
19. Muriatic (hydrochloric) acid	58,165	14,541
20. Styrene (liquid)	55,910	13,977

Source: GAO analysis of DOT data.

[a]Because the waybill sample data is extrapolated from a 1 percent sample, there will be uncertainties associated with the totals in this table.

[b]Nonbulk shipments that may consist of mixed materials.

[c]The sampling error for this estimate is approximately 25 percent of the value of the estimate. The sampling errors for all other estimates in this table do not exceed 5 percent of the value of those estimates.

Rail Shipments of Radioactive and Military Hazardous Materials Represent a Small Fraction of All Rail Shipments of Hazardous Materials

Rail shipments of radioactive and military hazardous materials are few compared with overall rail shipments of hazardous materials. Through its Military Traffic Management Command (MTMC), the Department of Defense (DOD) contracts with U.S. rail companies for the shipment of arms, ammunition, explosives, and other hazardous materials. The Department of the Navy and the Department of Energy (DOE) each ship radioactive material, including high-level spent nuclear fuel.

DOD Hazardous Materials Rail Shipments Include Arms, Ammunition, Explosives, Spent Nuclear Fuel, and Other Materials

From 1997 to 2001, MTMC shipped 728,000 tons of hazardous materials by rail, which represents a very small percentage of the 459 million tons of all hazardous materials shipped by rail during this time period. Although some DOD hazardous materials are shipped on dedicated trains, more often they are shipped in one- or two-car shipments and attached to trains with other nonmilitary cargoes. The dedicated shipments are usually done in conjunction with a planned exercise where a large amount of materials are needed.

The Naval Nuclear Propulsion Program, a joint organization within both the Department of Navy and Energy, ships naval spent nuclear fuel from shipyards to DOE's Idaho National Engineering and Environmental Laboratory for examination and temporary storage. According to program data, spent nuclear fuel from nuclear-powered warships accounts for approximately 0.05 percent of all spent nuclear fuel in the United States. From 1957 to 2001, the program shipped 738 containers of radioactive

material without a harmful release of radiation. According to the Department of the Navy, naval reactor components are designed robustly to withstand combat conditions.

DOE Ships Radioactive Waste Materials from Its Own Operations by Rail

DOE ships its own radioactive waste material shipments, including low-level radioactive material, transuranic waste, and spent nuclear fuel.[3] Within DOE, the Office of Environmental Management coordinates policies and program implementation for shipments of environmental radioactive waste. DOE's Office of Civilian Radioactive Waste Management would have responsibility for the proposed shipments to the Yucca Mountain Repository. Shipments made under the Office of Environmental Management are currently made mostly by truck; however, DOE is exploring the possibility of increasing rail shipments in the future. DOE officials estimate that of the approximately 500 shipments a month of low-level radioactive material made by DOE, less than 1 percent are made by rail.

Volume of Commercial Spent Nuclear Fuel Shipments Is Expected to Increase Substantially if the Yucca Mountain Repository Is Approved

According to Nuclear Regulatory Commission statistics, approximately 2 million pounds of spent nuclear fuel were transported by rail in the United States between 1979 and 1996. These amounts will increase greatly if a proposed private fuel storage facility in Utah is licensed for operation and will increase again if the proposed Yucca Mountain Repository is approved. Total shipments of spent nuclear fuel to the private fuel storage facility are estimated to be 88 million pounds, and the estimated total shipment to Yucca Mountain is 154 million pounds over a 24-year period. All the shipments to the private fuel storage facility would be by rail, while shipments to Yucca Mountain will be by both rail and truck.

[3]Transuranic waste is a type of radioactive waste created from the processing of nuclear materials. Transuranic elements include plutonium, americium, curium, and neptunium, all of which are created during nuclear reactor operations. Some transuranic elements are used in production of nuclear weapons, spacecraft batteries, and consumer products. The remaining unusable material containing transuranic elements is transuranic waste. Transuranic waste includes not only the transuranic elements themselves, but also ordinary items contaminated with transuranic elements: tools, gloves, protective suits, tarpaulins, soil, and sludge.

Safety and Security Issues Posed by Possible Future Rail Shipments of Spent Nuclear Fuel

Proposed Private Fuel Storage and Yucca Mountain Repository Plans Will Result in Substantial Increases in Rail Shipment of Radioactive Materials

If the proposed Yucca Mountain Repository in Nevada is licensed and begins operation, the number of spent nuclear fuel (SNF) shipments by rail would greatly increase in the future. Even without the operation of Yucca Mountain, there may be a substantial increase in the shipment of SNF from private efforts to ship and temporarily store SNF.

The most common method for storing SNF is in dry or wet fuel storage facilities on-site at nuclear plants. Some plants, however, are concerned about reaching full capacity for storage on-site and the ongoing expense associated with this type of storage. Under the Nuclear Waste Fund provision of the Nuclear Waste Policy Act of 1982, the operators of nuclear plants have been paying fees for a fund maintained by the Department of Energy (DOE) to pay for the proper disposal of SNF in a national repository,[1] proposed for Yucca Mountain.[2] To date, operators have not been able to ship any of their spent fuel off-site to the repository.

To address SNF on-site storage capacity issues, private power companies with more than one nuclear plant may ship SNF by rail from one plant to the storage facility of another if available storage capacity exists. Such intrautility transfers have constituted most commercial spent fuel shipments in the past. According to Nuclear Regulatory Commission (NRC) statistics, 1,057 metric tons of SNF were commercially transported by rail in the United States between 1979 and 1996 in 147 separate shipments. According to NRC data, no radioactive releases above the regulatory limit have occurred during any of these shipments. Table 5 shows the total metric tons and shipments of commercial spent nuclear fuel transported by rail and truck from 1979 to 1996.

[1]For storage purposes, SNF material is put into water pools to cool, both thermally and radioactively. The pools are known as wet storage. Dry storage is a newer technology that uses concrete and steel to allow heat and radioactivity to dissipate.

[2]42 U.S.C. § 10222.

Table 5: Transport of Commercial Spent Nuclear Fuel, 1979–1996

Mode	Metric tons of spent fuel	Shipments	Average metric tons per shipment
Rail	1,057	147	7.2
Truck	356	1,172	0.3
Total	**1,413**	**1,319**	**1.1**

Source: Congressional Research Service.

DOE Estimates That 70,000 Metric Tons of SNF Would Be Shipped to the Proposed Yucca Mountain National Repository over a 24-Year Period

The proposed Yucca Mountain Repository in Nevada would be the largest to hold SNF in the country. Although the repository is not yet licensed, and would not be scheduled to begin operations until 2010, studies and preparations for these shipments have been under way for some time. According to DOE's Environmental Impact Statement for Yucca Mountain, approximately 70,000 metric tons of SNF would be shipped to the repository over a 24-year period. DOE officials currently favor the use of trains versus trucks as the primary mode of transporting SNF to Yucca Mountain. This decision, however, has not been finalized. The use of rail would require fewer overall shipments than the use of trucks due to the larger transport capacity of trains. If trains are chosen as the primary mode of transportation for SNF to Yucca Mountain, DOE estimates that, on average, 130 trains carrying approximately 400 casks would transport SNF every year for 24 years.[3] A rail shipment may include up to three rail casks.

If trains were to be used, a new rail line would need to be constructed to connect the repository to main line railroad tracks. The rail line would be approximately 100 to 300 miles in length depending on the corridor selected. In addition, specific routes for SNF shipments would also have to be selected. Finally, DOE would have to determine whether or not to use dedicated trains to make these shipments.

Association of American Railroads Endorses the Use of Dedicated Trains for SNF Shipments to Yucca Mountain

The Association of American Railroads (AAR) has endorsed the use of dedicated trains for shipments of SNF to Yucca Mountain. Dedicated trains would allow shipments to travel from origin to destination as quickly as possible, thereby minimizing exposure en route and time spent in rail

[3]A cask is a hardened container designed specifically for holding SNF. NRC certifies cask designs.

yards. AAR's position is that advanced technology that is not routinely used in regular trains, such as that used for derailment prevention, could be incorporated in a dedicated train. The Department of Transportation (DOT) is currently drafting a report on the safety of using dedicated trains for the rail shipment of spent nuclear fuel.

Proposed Shipment of Spent Nuclear Fuel by Private Fuel Storage, LLC, Would Also Result in a Substantial Increase in Shipments

In order to gain additional storage capacity for SNF, a consortium of eight private utility companies, called Private Fuel Storage (PFS), LLC, working with the Skull Valley Band of the Goshute tribe, is pursuing a storage facility on tribal land. The Goshute reservation is located approximately 50 miles west of Salt Lake City, Utah. This proposed storage facility would also result in a substantial increase in SNF shipments.

If licensed, the facility would receive up to 40,000 tons of SNF for storage. Unlike the Yucca Mountain repository, the PFS facility would be a temporary storage site rather than a permanent repository. An NRC license to store SNF lasts 20 years and is renewable. After the license expires, the facility would be decommissioned and the material taken off of the reservation. If the Yucca Mountain repository were in operation at that time, Yucca Mountain would be the likely recipient of this material. Provisions would need to be made to safely transport material to and from the Goshute Reservation.[4]

PFS anticipates receiving one to two trains weekly, each carrying two to four shipping casks containing 10 metric tons of uranium. Dedicated trains, stopping only for crew changes, refueling, and periodic inspections, would ship the material. A 32-mile rail line would be constructed by PFS on federal government owned land to connect the facility with the nearest railroad.

[4]In March 2003, a Nuclear Regulatory Commission licensing board blocked for the time being the issuance of a license to PFS because of the risks that military aircraft operations conducted near the facility might pose.

Historically Low Spent Nuclear Fuel Shipment Volumes Make Risk Assessment from Increased Shipments Difficult

It is difficult to assess the risk from the shipment of SNF using historic data, since the SNF shipments to date amount to only a small fraction of those proposed for shipment to the Yucca Mountain Repository and PFS. The 1,057 metric tons of spent fuel that was shipped by rail between 1979 and 1996 is small compared to proposed shipments to the Yucca Mountain Repository and PFS.

Even though no harmful radiation releases have occurred in past shipments of SNF, several questions still remain regarding the potential risk posed by these shipments, including

- whether the past safety record is indicative of potential future accidents given the difference in volume of materials shipped,
- what type of potential release is possible given cask design and proposed shipping practices, and
- what harm could be done by attacks on SNF shipments.

In addressing concerns about the potential for future accidents given the expected increase in spent nuclear fuel shipments, NRC officials told us that they believe that historical transport data for accident rates, in general, and for spent fuel shipments, in particular, support the conclusion that current regulatory programs result in a high degree of safety, even if applied to a larger shipment campaign. The officials said that NRC has sponsored risk studies that address the potential impacts related to changes in shipment parameters for future shipments to a waste facility.[5] They said that they believe there is an adequate technical basis to conclude current shipments are safe and that future compliant shipments will be safe.

[5]NUREG/CR-6672, *Reexamination of Spent Fuel Shipment Risk Estimates*, March 2000, which is also discussed in this appendix.

Studies Suggest That There is a Low Probability of Accidental Release of Radiation during Transportation of Spent Nuclear Fuel

Past federal studies have examined risks to the safety of the shipment of SNF and suggest that there is a low probability of accidental release of radiation during its transportation. To address safety issues associated with the shipment of SNF, NRC sponsored a series of studies to develop a predictive model of shipment risk. These include a study conducted by the Livermore National Laboratory. In addition, we convened a National Academy of Sciences panel of rail industry experts to identify issues involved in the safe and secure transport of hazardous materials by rail, including SNF.

Livermore National Laboratory Study

The Livermore National Laboratory "Modal Study," completed in 1987 and updated in 1995, concluded that 99.8 percent of all accidents involving SNF would not result in a harmful release of radiation. The Livermore Study relied on existing accident data to develop

- accident rates for trains and trucks,
- a distribution of accident speeds, and
- a distribution of types of accidents.

All of these data were then applied against the structural characteristics of SNF shipment casks to determine whether the type of accident described would result in a harmful release of radiation.

The Livermore Study is consistent with Research and Special Programs Administration data, which indicate that less than 0.10 percent of all current carloads of hazardous materials are involved in an accident that causes a release of hazardous material. This study also examined the effects of four severe scenarios derived from actual transportation accidents and concluded that in only one of the scenarios, which included an engulfing fire lasting several days, would the casks have failed to prevent package radiation levels from exceeding NRC limits.

The state of Nevada sponsored an assessment of the Livermore Study criticizing its findings on several counts. According to the assessment, (1) the methodology for deriving the accident rates may not have considered all the potential causes for cask failure, (2) the study does not take into consideration the possibility for human error in SNF cask construction and the effects that this could have in the severity of an accident, and (3) the computer simulation used in the Livermore study did not account for all

potential effects from high heat fires such as the breakdown of spent fuel pellets into gases or vapors.

In March 2000, NRC sponsored another study to update these earlier findings, entitled *Re-examination of Spent Fuel Shipment Risk Estimates*. The 2000 NRC study confirmed the results of an earlier 1977 NRC study and quantified the expected risk of transporting SNF. The 2000 study concluded that the rail accident risk was only 2 percent of the risk estimate in the prior study.

National Academy of Sciences Panel Expressed Confidence in the Safety and Security of Hazardous Material Rail Shipments

Experts at the GAO-sponsored National Academy of Sciences panel on the safety and security of hazardous material rail shipments also expressed that the risks of the transport of SNF were low relative to the risks of transporting other hazardous materials. An AAR representative at the panel, for example, did not cite SNF when discussing the hazardous materials that are of special concern for security in shipment. Panel participants noted that radioactive and nuclear material has historically been a source of anxiety in the United States, and that this public perception makes the shipment of radioactive material seem more of a problem than it is. One panelist noted that, although an attack on radioactive material in transit would be sure to attract a lot of media attention, the hardness of the cask would minimize damage and the potential for a radiation release. In comparison with SNF, he noted, other materials have the potential for a much greater lethal effect. One panelist, an emergency first responder, stated that he would rather have SNF going through his town than a shipment of gasoline because of the strength of the SNF container.

DOE Rebuts Aspects of Study on Safety Issues Regarding the Transportation of SNF Casks

In the aftermath of the July 2001 incident in the Howard Street Tunnel in Baltimore, Radioactive Waste Management Associates prepared a study that concluded that, had SNF casks been part of the train involved in that accident, the fire in the tunnel would have resulted in a release of contaminating radiation throughout a section of the city. This report stated that there are currently no requirements that SNF be transported separately from other hazardous cargo, and that the tunnel is part of a route identified as a potential rail corridor for SNF shipments, concluding that it is feasible that a cask could have been part of the burning train in the tunnel. DOE provided us with a criticism of the study prepared by staff from Sandia National Laboratory disputing the conclusions of the report. According to DOE officials, at least one buffer car must separate a SNF car from a car containing any hazardous materials. DOE officials said because of the separation of at least one car length and the slow, rather than

catastrophic, leak of the tripropylene, the most intense fire heat would have been localized at the tripropylene car and not at adjacent cars.

In March 2003, NRC also released a report that examined the Baltimore tunnel fire incident and evaluated what the consequences would have been had a spent nuclear fuel transportation cask been in the train accident in the tunnel.[6] NRC concluded in its report that, for a spent nuclear fuel transportation cask approved under NRC rules for packaging and transportation of radioactive materials[7] and subjected to the conditions encountered in the Howard Street tunnel fire, no release of radioactive materials would have resulted from this postulated event. In addition, the health and safety of the public would have been maintained.

Safety and Security Issues Posed by the Substantial Increase in Future SNF Shipments and Potential New Threats for These Shipments Are Being Studied

Since the 1970s, DOE and NRC have conducted several studies of the effect of sabotage on the transportation of SNF. These studies found that a successful sabotage attack on spent nuclear fuel being transported would have a limited effect on human health. A study published by DOE's Sandia National Laboratory in 1999 confirmed earlier studies that, under certain worst-case scenarios, NRC-certified transportation containers could be penetrated by armor-piercing weapons and release small quantities of radioactive materials.[8]

Nevertheless, despite their general confidence in the safety of current regulations for the transportation of spent nuclear fuel shipments, federal regulators are preparing to address new safety and security issues posed by the substantial increase in the number of these shipments in the future and new threats posed after the terrorist attacks on September 11, 2001. DOE's Sandia National Laboratory is currently conducting a cask sabotage investigation project. Upon its completion, DOE plans to use results of the project to support its decisions with regard to proposed SNF safeguard and security procedures. According to DOE, closer estimates of the consequence of a successful sabotage attack would support policy decisions relating to the safeguard levels required for SNF shipments, and a

[6]NUREG/CR-6799, *Analysis of Rail Car Components Exposed to a Tunnel Fire Environment*, March 2003.

[7]10 C.F.R. 71.

[8]Sandia National Laboratories, *Projected Source Terms for Potential Sabotage Events Related to Spent Fuel Shipments*, SAND99-0963 (Albuquerque, New Mexico: 1999).

better-defined consequence might also be expected to reduce the cost of safeguards. DOE and the Federal Railroad Administration (FRA) are also reexamining the potential need for routing requirements for SNF rail shipments given the increase in the expected volume of shipments traveling through heavily populated rail corridors. NRC is also studying the potential vulnerabilities to the security of spent fuel and has ongoing work related to the performance of spent nuclear fuel containers in accident scenarios.

Finally, we are currently undertaking a study assessing the findings of federally-sponsored studies of sabotage and severe accidents involving spent nuclear fuel.

Emergency Response Procedures and Available Resources to Assist Local First Responders

General Procedures for Emergency Response

The recognized method for managing an emergency response is the incident command system, an on-site management system applicable to all types of emergencies. It includes a standard organizational structure, training requirements, procedures, and terminology that enable participating agencies to function together effectively and efficiently in response to an emergency. Hazardous material rail incidents involve a multidiscipline emergency management response approach. While the immediate response is primarily local, both state and federal governments also provide additional resources if the need arises.

Typically, at the local level, fire, law enforcement, public works, emergency medical service, and railroad personnel would be the first responders to a hazardous material rail incident. For these incidents, a locality's fire department is the lead agency in a hazardous material incident response. Within fire departments that have hazardous material teams, these teams lead the response to a hazardous material rail incident. Chemical experts or responders from private industry may provide additional response assistance.

In response to any suspected hazardous material incident, responders near or first arriving at the event do an initial reconnaissance to determine the materials involved and the need for additional resources. Initial responders determine if an evacuation or shelter in place is needed based on recommendations from the *Emergency Response Guidebook*.[1] If hazardous material incidents are major events, the response would also include an activation of an emergency operations command center (if one is in place), the Red Cross, state environmental protection agencies, state emergency management agencies and, in some cases, federal agencies.

To prepare for responding to hazardous material incidents, local communities—frequently with state, federal, and industry partners—often conduct preparedness drills, develop emergency response plans, obtain technical training, and procure specialized equipment for first responders. Although there is no difference in an emergency response to a hazardous material incident whether it is the result of an accident or terrorist attack, in cases of terrorism, law enforcement would play a greater role in a

[1]The U.S. Department of Transportation (DOT), Transport Canada, and the Secretariat of Transport and Communications of Mexico developed the *Emergency Response Guidebook* jointly for use by fire fighters, police, and other emergency services personnel who respond to hazardous material incidents.

locality's overall response and coordinate a criminal investigation. Local law enforcement would make a determination whether federal law enforcement assistance is necessary for an investigation.

At the state level, a hazardous material response team typically assists those localities needing additional resources. In the states that we visited, such teams provided hazardous material response capability for locations that did not have their own hazardous material teams. In addition, state environmental agencies provide assistance in incident mitigation and monitoring of the environment.

In some instances, federal emergency response assistance may be called for by state and local governments or by the circumstances of the hazardous material incident. For example, the Department of Homeland Security's (DHS) Emergency Preparedness and Response (EP&R) Directorate may be requested to provide federal disaster assistance to an area. The Environmental Protection Agency (EPA) and the U.S. Coast Guard (USCG), which is now housed within DHS, are required by the National Contingency Plan to be notified and may send representatives to the incident scene to assist in evaluating the environmental damage resulting from a hazardous material release. However, more robust state and federal resources are generally reserved for more serious incidents, such as the July 2001 derailment in Baltimore that involved a release of hazardous materials in a populated area.

Multiple Federal Plans and Agencies Provide Additional Resources to Address Hazardous Material Incidents

Three federal response plans address emergencies involving hazardous material releases during rail transport: the Federal Response Plan, the National Contingency Plan (part of the National Response System), and the Federal Radiological Emergency Response Plan. These plans all involve multiple federal agencies in their administration. The primary federal agencies with a role in emergency response for hazardous material incidents are DHS' Transportation Security Administration (TSA), EP&R Directorate, and USCG, EPA, DOT, Department of Energy (DOE), Nuclear Regulatory Commission (NRC), and Department of Labor's Occupational Safety and Health Administration (OSHA). The Office of Domestic Preparedness (ODP)—formerly part of the Department of Justice (DOJ) and now in DHS—, the Department of Health and Human Services (HHS), and OSHA provide funding for equipment procurement, planning, or training activities. HHS and OSHA also provide consultations in emergencies when requested.

Federal Response Plan Addresses All Types of Hazards

The Federal Response Plan is an all hazard response plan carried out by the DHS EP&R Directorate and 26 other partner federal organizations. The plan provides the mechanism for delivery of federal assistance and resources to augment state and local government efforts in a major disaster or emergency. The plan provides for response with initial resources such as food, water, and emergency generators. The plan also provides additional resources to state and local governments to recover from an emergency.

The plan categorizes the types of federal assistance that a state is most likely to need into 12 emergency support functions. These functions are: transportation, communications, public works and engineering, firefighting, information and planning, mass care, resource support, health and medical services, urban search and rescue, hazardous materials, food, and energy. Each emergency support function is headed by a primary agency designated on the basis of its capability in that area.

Federal Radiological Emergency Response Plan Coordinates Federal Response to Radiological Emergencies

The objective of the Federal Radiological Emergency Response Plan, also published by DHS' EP&R Directorate, is to establish an organized and integrated capability for a timely, coordinated response by federal agencies to peacetime radiological emergencies. According to the plan, the lead federal agency for incidents involving the transportation of radioactive materials varies by circumstance: the NRC is the lead federal agency for an emergency that involves radiological material licensed by the NRC or an agreement state, DOD or DOE are the lead federal agencies when radiological material is shipped by these agencies at the time of an accident, and EPA is the lead federal agency when an emergency involves radiological material that is not licensed or owned by a federal agency or an agreement state. [2]

National Contingency Plan Addresses Oil Spills and Hazardous Substance Releases

The National Oil and Hazardous Substances Pollution Contingency Plan, more commonly called the National Contingency Plan, is the federal government's plan for responding to both oil spills and hazardous substance releases. The lead federal agencies for responding to hazardous substance releases under the National Contingency Plan are EPA for inland

[2]Agreement states are states establishing programs under 42 U.S.C. § 2021(b) to permit states to exercise some of NRC's authority.

zones and the USCG for coastal zones, although DOD, DOE, and other federal agencies are the lead agencies in certain circumstances.

The National Response Center, created by the National Contingency Plan, receives notifications of chemical, radiological, oil, and biological releases. Transportation accidents involving hazardous materials must be reported to the National Response Center by the carrier involved if the accident meets one or more of the criteria developed by the center. Some of these criteria include the following: a person is killed, a person receives injuries requiring hospitalization, property damage exceeds $50,000, an evacuation of the general public is required lasting 1 hour or more, and there is a release of marine pollutant in a quantity exceeding 119 gallons for liquids or 882 pounds for solids. In addition, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 requires that all releases of hazardous substances exceeding reportable quantities be reported by the responsible party to the center.

National Contingency Plan Has Three Organizational Levels: National Response Team, Regional Response Teams, and On scene Coordinators

The National Response Team's membership consists of 16 federal agencies with expertise in various aspects of emergency response to pollution incidents. EPA serves as the chair agency and the USCG serves as the vice-chair agency of the National Response Team. The team is a national planning, policy, and coordinating body and does not physically respond to incidents.

The National Contingency Plan has 13 regional response teams that are also planning, policy, and coordinating bodies and do not physically respond to the scene of an incident. The regional response teams provide assistance to state and local governments in preparedness, planning, and training for emergency response. Another function of the teams is to provide technical assistance to local and state emergency planning committees to enhance local emergency response planning. The teams also coordinate the regional deployment of assets.

On scene coordinators are federal officials predesignated by EPA for inland areas and by the USCG for coastal areas. The on scene coordinators have the authority to coordinate containment, removal and disposal efforts, and resources during an oil spill or hazardous substance release. On scene coordinators for the USCG handle incidents within or threatening the coastal zone, while their EPA counterparts are responsible for discharges into, or threatening, the inland zone. This responsibility includes coordinating federal, state, local, and responsible party efforts. The USCG National Strike Force, which consists of three strike teams and a

coordination center equipped to respond to major oil spills and chemical releases, assists on scene coordinators in incident response. On scene coordinators also have access to special teams, both those listed in the National Contingency Plan, such as the USCG National Strike Force and EPA Environmental Response Teams, and those not specifically listed in the plan, such as Department of Defense teams.

National Contingency Plan is Part of the National Response System to Prepare and Respond to Oil and Hazardous Material Incidents

The National Contingency Plan is a component of the National Response System, a structure for preparedness and response to oil and hazardous material incidents that has been in place for over 30 years. The National Response System consists of a network of interagency coordinating groups at the national, regional, area, and local levels that are responsible for preparedness activities. The system establishes a network of contingency plans with different levels of geographical scope that form the federal government's efforts to prepare and coordinate responses to emergency incidents. In addition to the National Contingency Plan, there are regional and area contingency plans that coordinate effective responses within each of the 10 standard federal regions and other designated areas covering Alaska, the Caribbean, and several islands in the Pacific. These plans include preparedness information on a regional level and identify useful response facilities and resources available from government, commercial, academic, and other sources. At the local level, the National Response System includes local contingency plans to prepare and organize local resources in the event of accidental releases of hazardous substances.

USCG officials told us that the National Response System's coordinating bodies strive for continual improvement through an ongoing process of plan development, exercises, and evaluation. Plans and capabilities are tested through exercises; exercise evaluations provide lessons learned which, in turn, may result in changes to the plan or modifications to resource capability. USCG officials told us that, while there currently exists no national assessment tool to measure preparedness, the National Response System's process provides a mechanism for evaluation and improvement.

Federal Agencies Provide a Variety of Assistance for Responding to and Improving Preparedness for Hazardous Material Rail Incidents

Many federal agencies are responsible for providing either on-scene response assistance or offering technical expertise in the event of a hazardous material rail incident. As discussed above, many of these agencies play a role in the administration of federal response plans. Table 6 lists the agencies responsible for providing either on-scene assistance or technical expertise in the event of a hazardous material rail incident and outlines their roles.

Table 6: Federal Agencies Involved in Emergency Response to Hazardous Material Incidents

Agency	Role
DHS	TSA TSA is involved in managing transportation security in the event of a threat via hazardous materials. TSA also has emergency powers in the event of a national emergency.[a] EP&R Directorate The EP&R Directorate is responsible for implementing and managing federal disaster assistance. Federal assistance is available to supplement the resources of state and local governments in major disasters, such as emergencies involving hazardous material releases. Most federal assistance becomes available only following a declaration by the President under the Robert T. Stafford Disaster Relief and Emergency Assistance Act at the request of a state governor or the immediate declaration by the President. USCG USCG maintains the National Strike Force, which is comprised of three strike teams and the National Strike Force Coordination Center. The strike force is responsible for providing highly-trained responders and equipment in support of the USCG and EPA federal on scene coordinators who respond to oil discharges and hazardous substances releases. The USCG's Emergency Response Notification System database also records releases. The USCG maintains this database. The USCG can respond to a hazardous material rail incident in the coastal zone whenever there is a threat to public health or the environment. The National Contingency Plan outlines the appropriate response in the event of a spill.
DOT	Research and Special Programs Administration (RSPA) RSPA issues the *Emergency Response Guidebook* to assist first responders by identifying the potential effects of hazardous materials by type. RSPA has been issuing this guidebook in various formats since the late 1970s, and it recently distributed over 1.5 million copies of the latest edition. In 1997, RSPA, in conjunction with the Canadian and Mexican governments, issued a joint North American copy of the guidebook.

(Continued From Previous Page)

Agency	Role
EPA	EPA can respond to a hazardous material rail incident whenever there is a threat to public health or the environment. Typically, EPA is invited to incident scenes by first responders or local emergency management agencies. The National Contingency Plan outlines appropriate responses by EPA in the event of an oil spill or hazardous substance release. Under the Federal Radiological Emergency Response Plan, EPA is the lead agency when the source of the radioactivity is unknown. Examples of unknown sources include scrap shipped from overseas and materials with unknown owners.
DOE	DOE participates in the Federal Radiological Emergency Response Plan that coordinates the federal government response to radiological emergencies. DOE participates in the Federal Radiological Preparedness Coordinating Committee. DOE is the lead federal agency for response to an emergency involving materials that are in DOE custody. DOE also has the initial responsibility for coordinating off-site federal radiological monitoring and assessment assistance during response to a radiological emergency. DOE may respond to a state or lead federal agency request for assistance by dispatching a Radiological Assistance Program team. According to DOE officials, if the situation requires more assistance than a team can provide, DOE will alert or activate additional resources, including the Aerial Measuring System, Atmospheric Release Advisory Capability, Accident Response Group, Federal Radiological Monitoring and Assessment Center, Nuclear Emergency Search Team, and Radiation Emergency Assistance Center and Training Site.
NRC	NRC is the lead federal agency for emergency response to radiological events involving NRC-licensed facilities and the transportation of licensed materials. Although state and local governments would be the actual responders to an accident or incident involving radioactive material, NRC's response teams follow events as they unfold in a radiological shipment incident and provide federal resources to responders. When the source of shipments of radioactive materials cannot be identified during an incident, NRC would assist the EPA's Radiological Response Teams to identify the source.
OSHA	OSHA is a member of the National Response Team and provides assistance to ensure the safety and health of personnel deployed at emergency response sites.

Sources: GAO analysis of DHS' EP&R Directorate, USCG, DOT, EPA, DOE, and NRC data.

[a]Per 49 U.S.C. § 114(g).

In addition to providing on-scene assistance or technical expertise in the event of a hazardous material incident, some of the same federal agencies listed above provide training or grant assistance to local communities to improve their emergency preparedness for hazardous material incidents. Tables 7 to 11 list the federal agencies that have some role in providing a variety of assistance and grants to emergency responders.

Table 7: Hazardous Material Emergency Response Assistance and Grants Provided by the Department of Homeland Security's Office of Domestic Preparedness (Formerly a Department of Justice Program)

Catalog of Federal Domestic Assistance (CFDA) number[a]	Assistance program grant title	Purpose	FY 2002 funding[b]
16.007	State Domestic Preparedness Equipment Support Program	Funding provided to states to plan for and execute a comprehensive threat and needs assessment to develop a three-year plan to enhance first responder capabilities, and to provide for equipment purchases and the provision of specialized training.	$481 million
16.008	Domestic Preparedness Training and Technical Assistance Program	Funding to train state and local jurisdictions to respond to weapons of mass destruction domestic terrorist incidents, involving nuclear, biological, chemical, and explosive devices	$62 million
16.580 16.597 16.599[c]		Organizations, rather than state and local entities, are the one-time recipients of these funds. Grants are used for a multitude of purposes including, but not limited to, meetings to share best practices and facilitate discussion on public and private partnerships.	$17 million

Sources: GAO analysis of DHS and CFDA data.

[a] CFDA is the governmentwide source document of federal domestic assistance program information produced by the executive branch.

[b] According to ODP officials, the total amount awarded in fiscal year 2002 does not include contracts or interagency agreements, which is approximately $24 million.

[c] According to ODP officials, this program includes multifunding for different purposes.

Table 8: Hazardous Material Emergency Response Assistance and Grants Provided by the Department of Transportation's Research and Special Programs Administration

CFDA Number	Assistance program grant title	Purpose	FY 2002 funding
20.703	Hazardous material emergency preparedness training and planning grants	Intended to provide financial and technical assistance as well as national direction and guidance to enhance state, territorial, tribal, and local hazardous material emergency planning and training. This program distributes fees collected from shippers and carriers of hazardous materials to emergency responders for training and to local emergency planning committees (LEPCs) for planning.[a]	$13.05 million[b]

Sources: GAO analysis of DOT and CFDA data.

[a]Established under the Emergency Planning and Community Right to Know Act of 1986, LEPCs must develop an emergency plan and review it at least annually. LEPC membership includes representatives from police, fire, civil defense, public health, transportation, environmental agencies, as well as representatives from facilities subject to emergency planning requirements, community groups, and the media.

[b]$7.8 million of this funding is for the training of emergency responders, $5 million is for LEPC planning, and $250,000 is for International Association of Fire Fighter instructor training in hazardous material response operations.

Table 9: Hazardous Material Emergency Response and Assistance Grants Provided by the Department of Homeland Security's Directorate of Emergency Preparedness and Response

CFDA number	Assistance program grant title	Purpose	FY 2002 funding
83.012	Hazardous materials assistance program	Provides technical and financial assistance through the states to support state, local, and American Indian tribal governments in oil and hazardous materials emergency planning and exercising and to enhance state, tribal, and local governments capabilities to interoperate with the National Response System.	$264,000
83.547	First responder counter-terrorism training assistance	Designed to enhance the capabilities of first responders in managing the consequences of terrorist acts.	$4 million
83.552	Emergency management performance grants	Designed to develop comprehensive emergency management, including terrorism consequence management preparedness, at the state and local levels and to improve emergency planning, preparedness, mitigation, response, and recovery capabilities.	$134 million
83.554	Assistance to firefighters grant	Designed to enhance abilities with respect to fire and fire-related hazards. This program seeks to identify departments that lack the basic tools and resources necessary to protect the health and safety of the public and their firefighting personnel.	$144 million
83.009 83.010	Hazardous materials/weapons of mass destruction (WMD) training standards and requirements guidance and training quality control technical assistance (under interagency agreement with DOT)	Provides guidance and technical assistance to state and major metropolitan training departments on managing and implementing hazardous material and WMD responder training. Purpose is to improve the quality of hazardous material/WMD responder training nationally and the cost-effectiveness of state and local use of federal training funds in hazardous material and WMD response training.	$1.5 million
83.527 83.530	Hazardous materials/WMD responder training curriculum	The National Fire Academy and the Emergency Management Institute offer complete and definitive curricula for all facets of local responder training for hazardous material and WMD incidents.	$1.2 million
83.549	Chemical stockpile emergency preparedness program	To enhance emergency preparedness capabilities of the states and local communities at each of the chemical agent stockpile storage facilities. The purpose of the program is to assist states and local communities in efforts to improve their capacity to plan for and respond to accidents associated with the storage of chemical warfare materials.	$82 million
83.562 83.563 83.564	FY 2002 supplemental grants for state and local preparedness	Provide funding assistance to state and local governments to update their emergency operations plans for all hazards with special emphasis on WMD terrorism preparedness. Funds will also be used to support the formation of citizen corps councils, expansion of the community emergency response team program, and to improve state emergency operations centers.	$181 million

Sources: GAO analysis of DHS, CFDA, and National Volunteer Fire Council data.

Table 10: Hazardous Material Emergency Response Assistance and Grants Provided by the Department of Health and Human Services

CFDA number	Assistance program grant title	Purpose	FY 2002 funding
93.003	Metropolitan Medical Response System Program (part of the Public Health and Social Services Emergency Fund)	Provides assistance to U.S. cities, via contracts, to prepare for a rapid, coordinated medical response to large-scale public emergencies. The contracts enable cities to coordinate emergency first responders, public health systems, and hospitals to better respond to the needs of their citizens in times of crisis.	$10 million
93.204	Surveillance of hazardous substance emergency events	To assist state health departments in developing a state-based surveillance system to monitor hazardous substance emergency events and public health impact. The Hazardous Substances and Emergency Events Surveillance Program, managed by the Agency for Toxic Substances and Disease Registry's Division of Health Studies, provides data to show what the health impacts have been of previous hazardous material releases, which could be used in preparing threat assessments.	$1.5 million

Sources: GAO analysis of HHS and CFDA data.

Table 11: Hazardous Material Emergency Response Assistance and Grants Provided by the Department of Energy[a]

CFDA Number	Assistance program grant title	Purpose	FY 2002 funding
81.106	Transport of Transuranic wastes to the Waste Isolation Pilot Plant: States and tribal concerns, proposed solutions	Financial assistance is provided to support cooperation among the tribes, the southern, western, and midwestern states on the Waste Isolation Pilot Plant corridors, and DOE in developing plans and procedures for the safe and uneventful transportation of transuranic waste from current temporary storage facilities to the plant. Restrictions on the use of funds depends on the specific collaborative agreement. According to DOE officials, applicants must meet the guidelines established by DOE.	$3.2 million

Sources: GAO analysis of DOE and CFDA data.

[a]In addition to the Waste Isolation Pilot Plant program, DOE officials said that the Transportation Emergency Planning Program provides tools, including training materials and access to go-kits for instructors, and assists states and tribes in developing their transportation emergency capabilities through plans, procedures and training. DOE officials said that this is not a grant program and does not provide funding directly to states or tribes for emergency preparedness.

Private Organizations Also Play a Role in Emergency Response to Hazardous Material Incidents

Rail and chemical companies, both through their member organizations and individually, participate in a variety of outreach efforts to better prepare local emergency responders for hazardous material transportation incidents. Key private efforts include the Transportation Community Awareness Emergency Response Program (TRANSCAER), the Chemical Transportation Emergency Center (CHEMTREC), and the Operation Respond Emergency Information System (OREIS). Individual rail and chemical companies also work with local communities to prepare for hazardous material rail incidents through their participation in drills and sharing of emergency response plans.

Transportation Community Awareness Response Program Helps Prepare Local Communities for Hazardous Material Transportation Incidents

The American Chemistry Council; the Association of American Railroads; Chemical Education Foundation; National Tank Truck Carriers, Inc.; and the Chlorine Institute sponsor the TRANSCAER program to provide support to communities in preparation for transportation emergencies involving hazardous materials. TRANSCAER is supported through sponsor resources as well as monetary and in-kind contributions. TRANSCAER sponsors are directed to engage in a variety of activities with local communities to improve response capabilities in the event of a hazardous material transportation incident, including establishing contact with LEPCs, reviewing existing LEPC emergency response plans, assisting LEPCs with the establishment of transportation advisory groups, assisting LEPCs with the implementation of transportation flow studies, and participating in local emergency response training exercises.

24-hour Emergency Response Information Is Available to First Responders

CHEMTREC is a public service of the chemistry industry that provides services to shippers of hazardous materials, including a 24-hour, 7-day a week emergency call center that provides emergency response information in the event of a hazardous material incident. CHEMTREC was established in 1971 by the chemical industry as a public service hotline for firefighters, law enforcement, and other emergency responders to obtain information and assistance for emergency incidents involving chemicals and hazardous materials. If an accident occurs, an emergency responder can call CHEMTREC for information on the product being shipped.

First Responders Can Access Database of Rail Carriers in the Event of a Hazardous Material Incident

The rail transportation industry supports OREIS, a software system designed for use in passenger train and hazardous material incidents that connects first responders to the databases of railroad and motor carriers to allow them to obtain information quickly and accurately on the specific types of hazardous materials that may be involved in an incident and how these materials should be handled. All Class I railroads in the United States and Canada and several short line and regional railroads participate in the program. The program can be accessed over the Internet or with a computer software package. Operation Respond is a not-for-profit institution that distributes OREIS software and assists localities and transportation companies during a transportation emergency.

Individual Rail and Chemical Shipping Companies Participate in Local Emergency Response Activities

In addition to the industry-wide outreach initiatives discussed above, individual rail and chemical shipping companies work with local communities to develop preparedness for hazardous material incidents. For example, rail company officials that we interviewed said that they participated in preparedness drills, provided communities with emergency response guidelines, and participated in local emergency planning committee activities. Rail and chemical shipping company representatives also told us that they have hazardous material teams available on an on-call basis to travel to the scene of an incident to assist local communities in response.

Cooperative relationships between private sector industry and local communities to improve preparedness may be formalized or ad hoc. For example, in some cities, mutual aid agreements are used to leverage industry technical expertise to assist a community in responding in the event of an incident. In some cases, there are less formal relationships where rail companies provide copies of their emergency response plans to communities and meet with local officials only as the need arises. Overall, in our case study visits to 10 cities, we found that most cities had informal emergency response relationships with private sector industry, where resources were leveraged when needed.

Multiple Standards and Guidelines of Preparedness Exist

A variety of standards and self-assessment tools are available for local communities to address their own preparedness needs for hazardous material incidents. Some standards are focused on general emergency preparedness, while others are specific to preparing for and responding to hazardous material incidents or weapons of mass destruction events.

These standards come from several federal agencies and private organizations. However, the use of these standards is voluntary and not required by federal regulations, and local communities adopt their use based on individual needs. Our research identified a variety of emergency preparedness standards that have been adopted by local communities to respond to and prepare for hazardous material incidents by rail. These standards are described in the next section.

National Fire Protection Association Standards

The National Fire Protection Association (NFPA) is an international nonprofit organization that promotes fire safety through the consensus development of scientifically-based codes, standards, training, and education. There are three NFPA standards related to hazardous material incident response, with a fourth related standard for emergency management. The standards are as follows:

- Recommended Practices for Responding to Hazardous Materials Incidents (NFPA Standard 471) outlines recommended procedures for all organizations responsible for responding to incidents involving hazardous materials. These recommended practices include conducting annual training exercises to determine the adequacy and effectiveness of hazardous material emergency plans and updating hazardous material emergency response plans on an annual basis.

- Standard for Professional Competence of Responders to Hazardous Materials Incidents (NFPA Standard 472) identifies the levels of competency required of responders to hazardous materials incidents. The standard defines four different levels of first responders, including the awareness level, operational level, technician level, and incident commander level as well as the types of competencies expected at each of these first responder levels.

- Standard for Competencies for Emergency Medical Services Personnel Responding to Hazardous Materials Incidents (NFPA Standard 473) identifies the levels of competency required of emergency medical service personnel who respond to hazardous material incidents.

- Standards on Disaster/Emergency Management and Business Continuity Programs (NFPA Standard 1600) establishes minimum criteria for disaster/emergency management. The standards provide common program elements, techniques, and processes for disaster/emergency management planning and operations in the private and public sectors.

Occupational Safety and Health Administration Worker Protection Standard

The OSHA Hazardous Waste Operations and Emergency Response Standard establishes worker protection standards for emergency responders to hazardous material incidents. The standard provides

- procedures for handling emergency response,
- training requirements (including refresher training), and
- procedures for postemergency response operation.

EPA Hazardous Material Team Planning Guidance

EPA's hazardous material team-planning guidance provides assistance to local fire departments in identifying, acquiring, and maintaining the hazardous material response equipment and trained personnel appropriate for their locale. This manual provides guidance on

- determining requirements for hazardous material response,
- establishing the necessary level of expertise to meet those requirements,
- developing cost estimates for emergency response budget needs, and
- preparing emergency response and standard operating procedures to include all participants in a local response community.

Weapons of Mass Destruction Vulnerability Assessment and Training Standards

In order to receive grant funds from DHS' Office of Domestic Preparedness (which was formerly part of the Department of Justice) for weapons of mass destruction (WMD) preparedness, states are required to complete a vulnerability assessment to benchmark a current vulnerability profile with regard to a WMD terrorist incident. In addition, in August 2002, the Office of Domestic Preparedness issued new guidelines to assist first responders in determining their training needs and improve their performance to respond to a WMD terrorist incident.

HHS Guidance on Managing Hazardous Materials Incidents

HHS has developed a three-volume series of guidelines entitled *Managing Hazardous Materials Incidents* to help emergency response and health care professionals plan for and respond to hazardous material emergencies. Volumes I and II are generic planning guides to assist first responders and hospital personnel to plan for incidents that involve

hazardous materials. Examples of the types of guidance offered include appropriate personal protection equipment and suggested patient decontamination procedures. HHS is also developing training in incident stress management. Volume III is a guide for health care professionals who treat individuals who have been exposed to hazardous materials. Volume III describes 51 specific chemical protocols that provide recommendations for the on-scene and hospital medical management of patients exposed during a hazardous material incident.

State Capability Assessment for Readiness

In 1996, the U.S. Senate Committee on Appropriations asked the Federal Emergency Management Agency (FEMA), which is now part of DHS' EP&R Directorate, to develop a system of performance criteria that measures emergency management capabilities and operational readiness throughout the United States. The State Capability Assessment for Readiness is the EP&R Directorate's yearly status report on this effort. States self-assess their level of capability for 13 emergency management functions, such as hazard identification, risk assessment, and hazard mitigation, and the results are aggregated.

Officials from the EP&R Directorate told us they are working with the National Emergency Management Association and the International Association of Emergency Management to develop a local assessment tool that will provide local emergency managers the opportunity to evaluate their emergency management programs. According to EP&R Directorate officials, the local assessment tool is designed to complement a state's assessment tool to provide more accurate results. The EP&R Directorate has completed a draft of this document and it is currently under review by the National Emergency Management Association, the International Association of Emergency Management, states, and other organizations.

Emergency Management Accreditation Program Standards

The Emergency Management Accreditation Program is a voluntary accreditation process for state and local programs responsible for disaster mitigation, preparedness, response, and recovery. An independent team of emergency managers assesses states and local communities to determine whether their emergency response programs meet national standards. These standards are based on NFPA Standard 1600 for emergency management and business continuity programs and adapts them specifically for state and local use.

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