Chapter 5

Training for Hazardous Materials Transportation Enforcement and Emergency Response

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Training for Hazardous Materials Transportation Enforcement and Emergency Response

INTRODUCTION

Hazardous materials are transported over the Nation's vast system of highways, rails, waterways, and airlanes, necessitating multimodal enforcement and emergency response capabilities at all levels of government. Enforcement of hazardous materials transportation and modal safety regulations is an effective accident prevention tool if it is carried out by a well-trained and experienced inspection force.[1] The training law enforcement officers receive—on applicable laws and regulations, vehicles and vessels used to transport hazardous materials, inspection techniques, and sometimes the chemical and physical properties of the hazardous materials themselves—directly influences the ability of those officers to conduct thorough inspections and audits.

When transportation accidents involving hazardous materials do occur, local police officers and firefighters are usually the first officials to appear at the site. How they respond to the conditions they find there depends in large part on whether they have received emergency response training for those types of accidents. Moreover, should any injuries result from exposure to toxic materials, medical personnel will be able to respond appropriately only if they have had training in the treatment of such injuries.

The population in need of enforcement and emergency response training is wide and varied. Regulations governing the transportation of hazardous materials are enforced by Federal inspectors, State department of transportation employees, State Police, State public works department personnel, and local fire and police officers. Moreover, according to the National Association of Chiefs of Police, there are between 450,000 and 500,000 local sheriffs and police personnel employed by State and local government alone.[2]

Emergency response activities are similarly divided among numerous entities. The National Fire Academy reports there are approximately 1.2 million firefighters nationwide, 85 percent of whom are volunteers, and the remaining 15 percent paid employees of municipal, county, or local governmerits.[3] Federal, State, and local government and law enforcement officials, civil defense volunteers, health professionals, and the approximately 400,000 basic emergency medical technicians also need some training in assisting victims of hazardous materials accidents, depending on the scale and location of the accident and the materials involved.

For example, in December 1981, a tank truck carrying 40,000 pounds of toluene diisocyanate (TDI) skidded off the New York State Thruway and overturned, spilling some of its contents. TDI is transported in heated, insulated tank trucks to keep it in a liquid state. When the truck overturned, TDI spilled and congealed on exposure to the cold ground, contaminating the area around the tank truck as well as the clothing of two State troopers who had been called to the accident. Upon the of-

[1] For example, under a U.S. Department of Transportation demonstration program, Utah increased the number of inspections it conducted by 330 percent; it also experienced a 43-percent reduction in accidents involving commercial vehicles during the same year. Similarly, Idaho experienced 37 *percent* fewer commercial accidents in the same year that it increased its inspections by 268 percent and its weighings by **218** percent. U.S. Department of Transportation, Federal Highway Administration, Bureau of Motor Carrier Safety, "Interim Report, Commercial Motor Carrier Safety Inspection and Weighing Demonstration Program," unpublished typescript, August 1981.

[2] Gerald Arenberg, Executive Director, National Association of Chiefs of Police, personal communication, 1985.

[3] Joseph Donovan, then Director of the National Fire Academy, Federal Emergency Management Agency, Emmitsburg, MD, personal communication, 1985.

[4] Rocco V. Morando, Executive Director, National Registry of Emergency Medical Technicians, personal communication, June 1986.

ficers' return to their warm car, some of the TDI that had adhered to their shoes and pants vaporized, and they inhaled the toxic fumes. TDI enters tissue cells and irritates eyes, nose, and throat, and when inhaled in large quantities, damages the lungs. As a result of their exposure, both of these officers suffered permanent respiratory damage and have been unable to return to police work.[5]

Thus, State Police officers, who may enforce hazardous materials transportation regulations as part of their regular duties, also must be familiar with the dangers posed by the materials in case of an accident. The demands of their jobs illustrate some of the different levels of enforcement and emergency response training appropriate to meet the needs of some 2 million Federal, State, local, and private sector personnel.

What training is available to meet these diverse needs? In recent years, a number of studies and surveys have attempted to document the amount and type of training available.* The most recent is a congressionally mandated survey undertaken by the U.S. Department of Transportation (DOT) and the Federal Emergency Management Agency (FEMA). That survey identified 709 training organizations, public and private, that offer, or have recently offered, some form of hazardous materials training or planning,[6] although it did not determine how many will continue their courses. Responses to questionnaires provided by DOT and FEMA were received from 306 of these organizations, which together offer 468 training courses in some combination of enforcement, compliance, and emergency response.** The survey did not ask about the percentage of each course devoted to each type of training, limiting the analysis of the information collected. The courses offer a range of training activities, from home study training courses to more advanced programs involving lectures and field exercises.

[5]Harvy Lipman, "Accidents Can, and Do, Happen," *Times Union,* Albany, NY, Apr. 7, 1985, p. 1.

*The reference section at the end of this report identifies the surveys, studies, and reports relevant to the transportation of hazardous materials.

[6]U.S. Department of Transportation and Federal Emergency Management Agency, "Report to the Congress: Hazardous Materials Training, Planning, and Preparedness, " unpublished draft, 1986.

**Enforcement and compliance training are similar in content but are taught from different perspectives. Enforcement training is designed for government inspectors whereas the target audience for compliance training is usually private sector employees.

Photo credit: National Fire Academy

Field exercises and simulations of transportation accidents involving hazardous materials are effective training methods for emergency personnel.

The survey, covering the years 1980 to 1984, found that the 306 organizations trained approximately 380,000 students at a total cost of $36.9 million. Funds expended on training increased each year during the 5-year survey period, with the total annual funds spent by survey respondents rising from under $5 million in 1980 to more than $10 million in 1984. Educational institutions, including State training institutes, fire academies, and community colleges, offered the largest number of courses (see table 5-1). The primary audience for courses offered

Table 5.1 .—Summary of Training Courses, Hours, and Students by Organization Type, 1980-84

Organization type	Number of courses	Average hours per course[a]	Students completing per year
Private sector	45	7.5	23,187
Educational institution	164	26.7	12,995
Local government	79	19.2	9,098
State government	138	5.8	37,774
Federal Government	42	51.8	18,862

[a]Data are incomplete as some survey respondents did not provide information on the length of courses.

SOURCE: U.S. Department of Transportation and Federal Emergency Management Agency, "Report to the Congress: Hazardous Materials Training, Planning, and Preparedness," unpublished draft, 19S6.

Table 5-2.—Target Audiences for Compliance, Enforcement, and Response Training by Organization

Target audiences	Number of courses				
	Private sector	Educational institutions	Local government	State government	Federal Government
Shippers	20	47	2	39	6
Transportation companies	23	51	4	37	4
Private personnel	20	93	15	52	7
Elected officials	11	30	9	53	5
City/county administrators	10	39	20	61	4
Paid fire service	28	248	127	149	14
Volunteer fire service	30	246	55	150	
Law enforcement	27	128	55	176	26
Emergency management	24	152	61	132	10
Public works	9	72	27	76	5

SOURCE: U.S. Department of Transportation and Federal Emergency Management Agency, "Report to the Congress: Hazardous Materials Training, Planning, and Preparedness," unpublished draft, 19S6.

by Federal and State governments is law enforcement officers, followed by volunteer and paid fire service and emergency management personnel. Local governments emphasize training for paid fire service employees (see table 5-2).

Although the survey identifies the bulk of Federal dollars spent and the number of students trained by federally sponsored programs, it does not provide comprehensive data on State and local training. However, data from the survey, which appear to show an abundance of training activities, have meaning only when they are compared to the number of people who need training. The Office of Technology Assessment's (OTA's) evaluation of that need, presented in this chapter, indicates that only 25 percent of the Nation's 2 million emergency response personnel have been adequately trained, and that enforcement training has reached only a portion of the State and local law enforcement officers.

The sections that follow identify the populations in need of training, analyze the availability and effectiveness of existing hazardous materials enforcement and emergency response training programs, describe industry's involvement in compliance and response training, and provide congressional policy options aimed at improving the delivery of hazardous materials training. Enforcement and emergency response activities are considered separately because they are administered and funded by different organizations, particularly at the Federal level. Additional information on industry compliance training is presented in chapter 3.

Sources of information for this chapter include an OTA workshop on State and local activities, the DOT/FEMA study, a recent survey of State hazardous materials enforcement activities, and extensive interviews with Federal, State, regional, local, and industry officials and training officers.

PART 1: ENFORCEMENT ACTIVITIES AND TRAINING

Responsibility for enforcing hazardous materials transportation regulations is shared by Federal, State, and local agencies. In recent years, largely as a result of programs initiated by DOT, many States have established or improved programs to train highway enforcement officers and to educate shippers and carriers about compliance with hazardous materials regulations. Because Federal inspection capabilities have been decreasing, the importance of strong State and local efforts is underscored.

Federal Activities

Federal authority to enforce hazardous materials transportation regulations is distributed among numerous Federal agencies. Five of the agencies are within DOT: the Research and Special Programs Administration (RSPA) and four modal administrations—the U.S. Coast Guard, the Federal Aviation Administration (FAA), the Federal Railroad Administration (FRA), and the Federal Highway

Administration (FHWA). The other agencies are the U.S. Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), and, peripherally, the Occupational Safety and Health Administration (OSHA). These Federal agencies train their own enforcement officers, to ensure that their training is both adequate and readily available. Additional enforcement and compliance training is sponsored by the U.S. Postal Service, and the U.S. Departments of Justice, Energy, and Defense. Some Federal training programs, primarily those for the highway mode, are directed at improving State and local enforcement capabilities.

Department of Transportation

The Hazardous Materials Transportation Act (HMTA) provides DOT with the authority to impose both civil and criminal penalties against persons who violate the act or associated regulations.[7] While RSPA is responsible for issuing the hazardous materials regulations under the act, it shares enforcement responsibilities with each of DOT's modal administrations. RSPA's inspection and enforcement efforts are focused primarily on container manufacturers, reconditioners and retesters, and packaging exemption holders. The Coast Guard, with assistance from the National Cargo Bureau and the American Bureau of Shipping, conducts waterfront facility and vessel inspections. FAA inspects freight at air carrier facilities, which serve as collection points for packages coming from freight forwarders and shippers. FRA has responsibility for rail shipper, carrier, and freight forwarder facilities. FRA also inspects railroad tank and freight cars as well as bulk container manufacturers. FHWA inspects motor carrier and shipper facilities in addition to roadside or terminal checks of motor vehicles. All five agencies conduct investigations of accidents and incidents involving hazardous materials. It is important to emphasize that the modal administrations are responsible for monitoring compliance with general safety regulations as well as with hazardous materials regulations.

The extent and effectiveness of DOT's enforcement activities were criticized by the U.S. General Accounting Office and the National Transportation Safety Board in several reports in the early 1980s.[8] These studies found that the number of inspections conducted by DOT agencies was low compared with the number of businesses engaged in the transportation of hazardous materials. OTA's examination of DOT's enforcement statistics from 1978 to 1984 indicates that the situation has not changed significantly in the years after those studies. (See tables 5-3 and 5-4.) For two transport modes–air and water—inspections have actually decreased. The Coast Guard figures are the most striking; waterfront inspections dropped from 16,865 in 1978 to 828 in 1984. While highway and rail inspections have increased, they are still extremely low relative to the total number of companies, vehicles, and vessels in operation. It is estimated that more than 30,000 shippers at 100,000 locations are subject to the HMTA, yet only 5,220 inspections were undertaken in 1984. Inspections of container manufacturers are also low; in 1984, only 144 out of more than 7,000 container manufacturers were inspected.

The principal reason for the low inspection rate is the shortage of DOT personnel, especially those with training in hazardous materials enforcement. Table 5-5 shows the number of full- and part-time inspectors by agency and the total work-years they represent over a 5-year period. With the exception of FRA, all of the agencies have experienced inspection staff reductions in recent years. The total number of work-years for all agencies decreased from 236.6 years in 1979 to 111 years in 1984. As inspection forces have been decreasing, shipments of hazardous materials by truck alone have been increasing about 3 to 4 percent annually.[9] OTA

[7] 'Civil penalties, which may not exceed $10,000 per violation, are used when any person "knowingly commits an act which is in violation of" the law or regulations. Standards for determining the amount of a civil penalty require the U.S. Department of Transportation to "take into account the nature, circumstances, extent, and gravity of the violation committed and, with respect to the person found to have committed such' violation, the degree of culpability, any history of prior offenses, ability to pay, effect on ability to continue to do business, and such other matters as justice may require. " Criminal sanctions apply when persons are found guilty of willful violations of the Hazardous Materials Transportation Act or a regulation; penalties under these circumstances may not exceed $25,000 and/or 5 years in prison for each offense (49 U.S.C. 1809(a)).

[8] For example, see U.S. General Accounting Office, *Programs for Ensuring the Safe Transportation of Hazardous Materials Need Improvement,* CED-81-5 (Washington, DC: Nov. 4, 1980); and National Transportation Safety Board, *Status of Department of Transportation's Hazardous Materials Regulatory Program,* NTSB-SR-81-2 (Washington, DC: Sept. 29, 1981).

[9] "Mark Abkowitz and George List, "Hazardous Materials Transportation: Commodity Flow and Information Systems," OTA contractor report, unpublished typescript, January 1986.

Table 5-3.—Number of Hazardous Materials Inspections and Investigations of Vehicles and Vessels

Agency/enforcement activity	1978	1979	1980	1981	1982	1983	1984
United States Coast Guard:							
. Vessels inspected	40,886	39,643	39,138	35,450	28,641	23,711	20,297
. Accidents/incidents investigated	4,135	9,148	4,130	4,060	9[b]	16	4
Federal Railroad Administration:							
• Railroad tank cars inspected	16,208	15,926	19,010	26,580	39,171	31,641	40,820
• Railroad freight cars inspected	7,783	7,620	7,914	7,100	13,024	10,547	13,001
Accidents/incidents investigated	405	398	523	629	538	426	553
Federal Highway Administration:							
• Motor vehicles inspected	3,790	3,470	3,362	6,061	5,980	7,536	6,325
• Accidents/incidents investigated	398	121	121	201	135	153	147
Federal Aviation Administration:							
. Accidents/incidents investigated	150	142	21	69	*94*	*54*	51
Research and Special Programs Administration:							
. Accidents/incidents investigated	2	2	1				

[a]1982-84 data include bulk and break bulk vessels. 197&81 data include only break bulk vessels. Break bulk refers to intermodal tanks and packaged goods.
[b]Prior t. 1982, data on all commercial vessel accidents and incidents, involving hazardous and nonhazardous materials, were included in DOT's annual reports. Beginning in 1982, data included in the annual reports were limited to hazardous materials accidents and incidents resulting in damages exceeding $50,000, a death, or serious injury.

SOURCE: Office of Technology Assessment based on U.S. Department of Transportation Annual Reports.

Table 5-4.—Number of Hazardous Materials Inspections of Operations and Facilities

Agency/type of inspection	1978	1979	1980	1981	1982	1983	1984
United States Coast Guard:							
• Waterfront	16,865	14,784	19,546	5,661[a]	3,603	662	828
Federal Aviation Administration:							
• Packages/shipping documents					18,758	10,286	9,660
• Carriers	6,506	6,334	1,698	6,064	6,418	4,055	3,818
• Shippers				463	587	181	
. Freight forwarders							312
Federal Highway Administration:							
• Carriers	1,521	1,556	1,470	2,406	3,419	3,369	2,957
• Shippers	1,203	1,343	1,673	2,109	2,849	2,758	2,808
• Container manufacturers	95						
Federal Railroad Administration:							
• Carriers	2,014	1,583	1,892	3,183	3,969	3,976	4,382
. Shippers	672	640	983	1,805	890	2,064	2,300
• Freight forwarders	114	89	76	91		108	135
• Container manufacturers	109	128	149	197	30:	45	102
Research and Special Programs Administration:							
• Carriers	15		1				
• Shippers	72	62	119		70	89	112
. Freight forwarders	6	33					
• Shipment observations			*90*	136	20	40	559
. Drum reconditioners		90	117	35	17	13	15
. Cylinder retesters			32	4	15	11	20

aprior t. 1981, data on waterfront facility inspections and spot checks for break bulk cargo were included in DOT's annual report. In 1981 and 1982, data on bulk liquid facility inspections were also included. Beginning in 1981, facility spot checks were discontinued due to budget reductions; the number of facility spot checks conducted in 1978, 1979, and 1980 were 14,988; 13,007; and 17,954, respectively. Break bulk refers to intermodal tanka and packaged goods.

SOURCE: Office of Technology Assessment based on U.S. Department of Transportation Annual Reports,

Photo credit U S Coast Guard

Coast Guard inspection requirements include an examination of the vessel and its loading apparatus.

concludes that the number of inspectors is insufficient to ensure adequate inspection levels.

Enforcement programs are further hampered by the absence of complete data on shippers on and carriers subject to the HMTA; one benefit of a registration program, described in chapter 2, would be the identification of the regulated community. Moreover, procedures followed by RSPA and the modal administrations for tracking violation histories, targeting inspections, and assessing penalties vary considerably. [10] An intermodal working group has recently been established within DOT to improve coordination of enforcement activities.[11]

DOT Enforcement Training.—The Transportation Safety Institute (TSI), a multimodal training establishment supported by the Department of Transportation, provides most of the hazardous materials transportation training for Federal employees. TSI courses are also open to State and local government employees and to private industry. General hazardous materials enforcement and compliance training and specialized training for each mode are available through TSI, both at TSI's facility in Oklahoma City and at State-operated sites on request.

Many States without sufficient resources to develop independent training programs send their inspectors to TSI courses. Priority for enforcement courses has been given to trainees from States participating in Federal grant programs. Between 1980 and 1985, 7,895 students were trained at TSI's Oklahoma City facility at a total cost of $1,077,600. State and local government employees made up more than half of the total student body for that period.[12] A summary of the courses offered by each DOT agency at TSI and other locations is presented in table 5-6.

Courses for both enforcement and inspection personnel and for shippers and carriers of hazardous materials are offered by RSPA. RSPA's general hazardous materials enforcement and inspection course has three phases: a self-study introduction that the student completes before attending class; a week of classroom instruction based on case studies; and a field exercise to be completed independently by the student once back on the job. Specific courses on cargo tanks and radioactive materials are also offered by RSPA. The intensive radioactive materials course, cosponsored with the Bureau of Motor Car-

[10] See U.S. General Accounting Office, op. cit.; National Transportation Safety Board, *Federal and State Enforcement Efforts in Hazardous Materials Transportation by Truck*, NTSB SEE 81-2 (Washington, DC: Feb. 19, 1981); Colin S. Diver, "A Study of the Effectiveness and Fairness of DOT Hazardous Materials Enforcement Penalties" Report to the General Counsel, U.S. Department of Transportation, June 1980; U.S. General Accounting Office, *Stronger Enforcement Would Help Improve Motor Carrier Safety*, GAO/RCED-85-64 (Washington, DC: Sept. 5, 1985); and U.S. General Accounting Office, *Management Improvement Could Enhance Enforcement of Coast Guard Marine Safety Programs*, GAO/RCED-85-59 (Washington, DC: Aug. 15, 1985).

[11] U.S. Department of Transportation, Research and Special Programs Administration, *Annual Report on Hazardous Materials Transportation—Calendar Year 1984* (Washington, DC: 1984), p. 29.

[12] Of the 7,895 students, 4,619 were State and local employees, while 1,784 were employed by the government. Other attendees were industry personnel and foreign students. David Goodman, Hazardous Materials Training Instructor, Transportation Safety Institute, Oklahoma City, OK, personal communication, Mar. 30, 1986.

Table 5-5.-Number of Hazardous Materials Transportation Inspectors and Work-Years[a]

	1979	1980	1981	1982	1983	1984
inspectors-ful14im9:						
United States Coast Guard	0	0	0	0	0	0
Federal Aviation Administration	12	12	10	0	10	11
Federal Highway Administration,	9	9	9	0	8	7
Federal Railroad Administration	19	24	25	23	33	34
Research and Special Programs Administration	9	10	7	6	6	7
Total	49	55	51	29	57	59
Inspectors —part-time:						
United States Coast Guard	770	770	1,298	403	570	570
Federal Aviation Administration ... ,	623	176	155	138	102	102
Federal Highway Administration.	152	161	153	149	144	142
Federal Railroad Administration	61	64	129	129	158	166
Research and Special Programs Administration	0	0	1	1	1	1
Total	1,606	1,171	1,736	820	975	981
Total work-years:						
United States Coast Guard	115.50	115.50	155.76	50.00	40.00	12.00
Federal Aviation Administration	36.90	19.04	17,75	8.20	14.08	15.00
Federal Highway Administration.	47.00	49.25	47.25	40.20	25.28	28,00
Federal Railroad Administration	28.20	33.60	34.65	33.00	46.40	48.00
Research and Special Programs Administration	9.00	10.00	7.50	6,75	6.75	7.50
Total	236.60	227.39	262.91	138.15	132.51	110.50

[a]The term work-years refers to the aggregate annual time spent by all inspectors in a mode.

SOURCE: Office of Technology based on U.S. Department of Transportation Annual Reports.

rier Safety, trained 120 students between 1980 and 1984.[13] Another course, designed to provide management-level employees of companies involved in the transportation of hazardous materials with basic working knowledge of the regulations, is taught at TSI.

In addition, a hazardous materials "train-the-trainer" course is offered by RSPA; train-the-trainer courses instruct individuals at a central location and then provide trained students with additional materials so that they can return to their jurisdictions and train others. This approach is a cost-effective way to augment training at the State and local levels. A network of such trained trainers, affiliated with the Commercial Vehicle Safety Alliance, is described later in this chapter.

The Federal Highway Administration's Bureau of Motor Carrier Safety (BCMS) currently offers a basic 8-hour training course in hazardous materials for State agencies. This course is given primarily to State law enforcement personnel by BMCS field staff; approximately 145 of these classes are offered each year. BMCS estimates that 14,460 students attended the basic 8-hour class during the period 1980-84.[14] In addition, courses on general motor carrier safety regulations are offered at TSI.[15]

Hazardous materials training for FRA inspectors is also available from TSI. Two courses—basic and advanced—provide instruction on the hazardous materials regulations applicable to the rail mode, with an emphasis on packaging and labeling of hazardous commodities. FRA inspectors who have attended a TSI training course may attend training programs at the Association of American Railroad's Transportation Test Center in Pueblo, Colorado.[16] Extensive training in general rail safety is also available at TSI.

[13]Data on numbers of courses and students were obtained from the Bureau of Motor Carrier Safety survey form completed for the U.S. Department of Transportation/Federal Emergency Management Agency study.

[14]Ibid.

[15]More extensive hazardous materials courses and a course on hazardous wastes transport were taught for a limited period of time, but they have been discontinued. Two new training programs will be introduced in 1986 and 1987. The first, which will be given at U.S. Department of Transportation regional offices, is on motor carrier safety organization and management objectives; the other is a 40-hour *course* at the Transportation Safety Institute covering hazardous materials and wastes enforcement. Bill Herster, Bureau of Motor Carrier Safety, Federal Highway Administration, personal communication, Apr. 3, 1986.

[16]Federal Railroad Administration inspectors may also participate in training programs offered by a chemical company in Milford, PA. Frank Fanelli, Federal Railroad Administration, U.S. Department of Transportation, personal communication, Apr. 2, 1986.

Table 5-6.—Department of Transportation Hazardous Materials Compliance and Enforcement Training Courses

Agency and course	Course type[a]	Hours per course	Students completing per year
Research and Special Programs Administration:			
Hazardous Materials Compliance and Enforcement[b]	CE	40	1,000
Intermodal Transportation of Hazardous Materials[b]	C	40	80
Hazardous Materials Train-the-Trainer[b]	CE	80	45
Cargo Tank Compliance and Enforcement[c]	CE	24	300
Cargo Tank Roadside Inspection[c]	CE	32	250
In-Depth Radioactive Materials[b c]	CE	32	40
Federal Highway Administration–Bureau of Motor Carrier Safety:			
Hazardous Materials for State Agencies[b]	CE	8	2,892
U.S. Coast Guard:[d]			
Port Operations Department	CER	320	70
Marine Safety Petty Officer	CER	240	210
Marine Safety Inspection Department Course	CE	280	70
Marine Safety Explosive Handling Supervisors Course	CE	80	240
Federal Railroad Administration:			
Hazardous Materials:			
Advanced[e]	CE	40	50
Basic	CE	40	25
Railroad Operating Course[b]	CE	8	6,107
Fedoral Aviation Administration:			
Air Transportation of Hazardous Materials:			
Advanced	CE	40	40
Basic	CE	72	40
Multimodal Shippers Course[e]	C	32	40

[a]C - Compliance, E - Enforcement, R - Response.
[b]Courses offered at Transportation Safety Institute and State locations
[c]This course is offered by Research and Special Programs Administration and cosponsored by the Federal Highway Administration.
[d]All courses offered at Yorktown, Virginia Training Center.
[e]Courses Offered at Transportation Safety Institute.

SOURCE: Office of Technology Assessment based on U.S. Department of Transportation and Federal Emergency Management Agency, "Report to the Congress: Hazardous Materials Training, Planning, and Preparedness," unpublished draft, 1986.

FRA has also sponsored the development of a video program for railroad and hazardous materials training. The Port Terminal Rail Authority (PTRA) in Houston received a grant from FRA to produce a demonstration program in conjunction with the Southern Pacific Railroad. One condition of the grant was that the training be made available to other railroads. The new system has been used to train an estimated 500 PTRA and Southern Pacific employees, and it has been demonstrated in several other locations. Other railroads have expressed interest in the program and are purchasing the necessary computer equipment. '7

The Coast Guard offers hazardous materials enforcement training at its Marine Safety School in Yorktown, Virginia. Although Yorktown courses are open to civilians and industry as space is available, most students are Coast Guard personnel. A 7-week course, offered by the Marine Safety Inspection Department, provides training on domestic and international hazardous materials regulations. A shorter class on explosives is also taught at Yorktown. Two additional courses, one for petty officers and another for officers, address basic marine safety; these courses cover both emergency response and enforcement. In addition to the Yorktown courses, occasional seminars are conducted in major port and harbor areas for shippers and carriers.*

FAA requires all new inspection and enforcement staff to attend a basic 2-week training course at TSI concerning the air transportation of hazardous materials. Subsequently, inspectors attend a l-week advanced refresher course every 2 years; this course was attended by 190 inspectors from 1980 to 1984.[18] In addition, a multimodal course, emphasizing the highway and air modes, is given at TSI for FAA depot and other staff responsible for handling, storing, and shipping hazardous materials.

Other Federal Agencies

Two other Federal agencies—EPA and NRC—have enforcement responsibilities relevant to the transportation of hazardous materials. EPA and NRC have delegated substantial regulatory and enforcement authority to the States. However, while NRC provides training for State personnel, most courses emphasize facility regulations. EPA enforcement efforts are focused on land disposal facility activities, and no formal enforcement training is offered to the States. EPA and NRC activities are described in box 5A. In addition, OSHA, responsible for the safety of workers employed by shippers and carriers of hazardous materials, offers courses

[17]Larry Helms, Port Terminal Rail Authority, personal communication, Apr. 1, 1986,

*A U.S. Coast Guard seminar on hazardous materials for shippers and carriers held at the Port of New York and New Jersey in April 1986 was attended by approximately 100 persons.

[18]John Garrett, Federal Aviation Administration, personal communication, Apr. 2, 1986.

BOX 5A.—The Environmental Protection Agency and the Nuclear Regulatory Commission Enforcement Training Activities

U.S. Environmental Protection Agency

The inspection and enforcement activities of the U.S. Environmental Protection Agency (EPA) relevant to transportation concern generators and transporters of hazardous wastes. EPA requirements for transporters of hazardous wastes consist of the U.S. Department of Transportation's (DOT) regulations for hazard communication, packaging, and reporting discharges, as well additional notification, marking, manifest, and cleanup requirements. Federal legislation allows States to administer and enforce hazardous waste programs in lieu of EPA if they meet certain requirements; programs in all but 7 States have been approved by EPA, and thus, 43 States are responsible for conducting inspections.

Under a 1980 Memorandum of Understanding between EPA and DOT, EPA may bring an enforcement action involving a waste transporter if the transportation is ancillary to other activities normally under EPA's jurisdiction, such as the storage or disposal of hazardous wastes. Additionally, EPA has agreed to make available to DOT any information regarding possible Hazardous Materials Transportation Act violations.

However, only a small percentage of EPA and State inspections target generators or transporters of hazardous wastes. Guidance for EPA regional and State hazardous waste regulatory programs requires only that sufficient resources be reserved to inspect 4 percent of the generators and transporters in their jurisdictions.[1] Moreover, few EPA inspectors receive formal training in the DOT hazardous wastes regulations. Three EPA regional offices have sent employees to Transportation Safety Institute training courses in the past, and only one region meets annually with DOT regional staff to coordinate inspection and enforcement activities and discuss any relevant regulatory changes.[2] At the State level, Federal funding under the Resource Conservation and Recovery Act may be used for staff training; EPA recommends that up to 5 percent of State grants be earmarked for training activities.[3] (See appendix A for additional information on EPA's hazardous wastes program.)

Nuclear Regulatory Commission

Responsibility for regulating the transportation of radioactive materials is divided between the Nuclear Regulatory Commission (NRC) and DOT. Under a Memorandum of Understanding, NRC is responsible for the design and performance of packages used to transport high-level radioactive materials; DOT has regulatory authority over packages used to ship low-level radioactive materials. Inspection and enforcement authority is similarly divided, although the agencies have agreed to consult each other on the results of inspections when they are related to each other's requirements. States participating in the NRC's Agreement State program have been granted regulatory and enforcement authority for certain types of radioactive materials.* NRC inspectors from three program areas—reactors, fuel facilities, and materials licensees-conduct both facility and transportation-related inspections.** Nationwide there are 30 to 40 reactor inspectors, 10 to 12 fuel facility inspectors, and 30 to 40 materials inspectors.[4]

Numerous training courses have been developed for NRC staff, some pertaining to specific subjects such as the transportation and packaging of radioactive materials. In addition, inspection and enforcement training for Federal and State employees is offered by NRC's Technical Training Center in Chattanooga,

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[1] U.S. Environmental Protection Agency, 1987 Resource Conservation and Recovery Act Implementation Plan, unpublished typescript, 1986, p. 14.

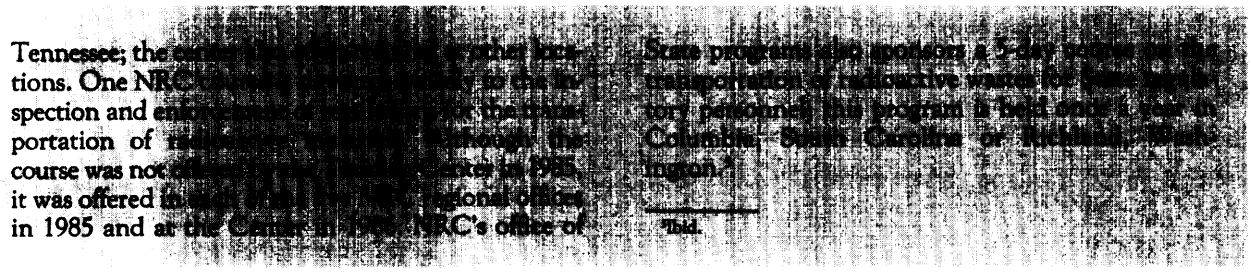
[2] Information on regional activities was provided by the following Environmental Protection Agency staff members: Jerry Levi and Dennis Huebner, Region I; Drew Leaman, Region 11; Jim Webb and Bruce Smith, Region 111; Alan Antley, Region IV; William Miner, Region V; Jim Stiebing and Dave Peters, Region VI; Bob Dona, Region VII; Diana Shannon, Region VIII; Philip Bobel, Region IX; and Dick Bauer and Betty Wiese, Region X, March 1986. The lack of coordination between EPA and DOT inspectors was also described in a 1983 congressional report. U.S. Congress, House Committee on Government Operations, *Improving the Effectiveness of the Bureau of Motor Carrier Safety and Its Enforcement of Hazardous Materials Regulations*, Report No. 98-562 (Washington, DC: U.S. Government Printing Office, Nov. 17, 1983), pp. 52-55.

[3] U.S. Environmental Protection Agency, op. cit., p. 25.

*Twenty-eight agreement States are responsible for byproduct material (radioisotopes), source materials (raw materials for atomic energy), small quantities of special nuclear materials, uranium and thorium tailings, and permanent disposal of low-level radioactive wastes. In addition, States have always had primary responsibility for the regulation of X-ray machines and other radiation producing equipment, accelerator-produced radioactive materials, and radium.

**The Nuclear Regulatory Commission is responsible for inspecting its licensees, which include public utilities, universities with accelerators and nuclear laboratories, hospitals, and industries that handle radioactive materials. Materials inspectors cover 5,000 to 6,000 small licensee% hospitals, laboratories, accelerators, etc.

[4] Alfred Grella, U.S. Nuclear Regulatory Commission, personal communication, May 1986.



Tennessee; the [illegible] other locations. One NRC [illegible] is the inspection and enforcement [illegible] portation of [illegible] course was not offered [illegible] it was offered in [illegible] regional offices in 1985 and at the Center in [illegible] NRC's office of State programs also sponsors a 5-day course on the transportation of radioactive wastes for State and local personnel; the program is held once a year in Columbia, South Carolina or Richland, Washington.[*]

*Ibid.

on hazardous materials and fire safety principles. The National Mine Health and Safety Academy, also affiliated with the Department of Labor, provides compliance, enforcement, and response training on hazardous materials.

Limited hazardous materials training is also offered to employees of the U.S. Postal Service. The Postal Service generally permits the mailing of hazardous materials classified by DOT as Other Regulated Material, as well as other hazardous materials such as etiologic agents and radioactive substances.[19] Packages containing hazardous materials sent by mail must comply with DOT regulations. Because Postal Service personnel generally may not open sealed mail, information on the contents of a package are obtained only from the mailer or if a package releases its contents. Thus, virtually all Postal Service employees need training in several areas: determining whether packages containing hazardous materials can be mailed, ensuring that DOT packaging and marking requirements are met, handling packages containing hazardous matter, and responding appropriately in the event of a hazardous materials release. A special hazardous materials training program was initiated by the Postal Service in 1982. As part of standard employee training, six training modules on hazardous materials are now offered at some 100 Postal Employee Development Centers. One module is a general awareness presentation, and the others are directed at specific employee groups—supervisors, acceptance clerks, transfer clerks, carriers, and mail handlers. Since the hazardous materials training program began, more than 37,000 employees have been trained;[20] however, this number is only a small percentage of the total Postal Service force. *

More generalized inspection and enforcement training for Federal inspectors is available through the Department of Justice's Federal Law Enforcement Training Center (FLETC). FLETC, located in Glynco, Georgia, provides 12 basic law enforcement training programs to 56 participating organizations, including Federal employees and some State and local enforcement personnel.[21]

The Department of Defense (DOD) and the Department of Energy (DOE), as shippers and carriers of hazardous and radioactive materials, also provide compliance training for their employees. A recent addition to hazardous materials enforcement training at TSI is a course for DOD personnel. The course, patterned after other TSI enforcement courses, is expected to begin in 1986 and will accommodate 50 students per class. The Air Force has developed courses on air and surface transportation of hazardous materials, and the Army Logistics Management Center provides training on handling hazardous materials.

The Transportation Management Program of the Department of Energy offers basic and advanced workshops on the transportation of radioactive materials, at which DOT and NRC regulations are covered. DOE courses are primarily for DOE employees and contractors, although commercial carriers and other government personnel may attend some courses as space permits. DOE also offers short ori-

[19]One example of an Other Regulated Material is a consumer commodity; the U.S. Department of Transportation hazard classes are defined in table 4-4, ch. 4. The US. Postal Service mailability requirements for hazardous materials are specified in U.S. Postal Service, *Acceptance of Hazardous, Restricted, or Perishable Matter*, publication 52 (Washington, DC: May 15, 1981 (periodically updated by transmittal letters)).

[20]The U.S. Postal Service trained 7,139 employees in 1982, 9,556 in 1983, 9,734 in 1984, and 10,730 in 1985. Steve Gordon, U.S. Postal Service, personal communication, Apr. 3, 1986.

*The employee figure is for fiscal year 1985. Of the 744,490 employees, 585,943 are full-time staff.

[21]Peggy Haywood, Public Affairs Officer, Federal Law Enforcement Training Center, Glynco, GA, personal communication, Apr. 2, 1986.

entation seminars on the transportation of hazardous materials for State and local police and fire officials. [22]

State and Local Activities

The contribution made by State and local inspection and enforcement forces to accident prevention has become increasingly important in light of a declining Federal enforcement presence and rising numbers of hazardous materials shipments. The number of State and local law enforcement officers is estimated to be 450,000 to 500,000.[23] Two Federal programs, directed at increasing State capabilities in managing the transportation of hazardous materials, grew out of studies conducted in the 1970s that identified needed improvements in State enforcement, data collection, and recordkeeping activities.

The first program, the State Hazardous Materials Enforcement Development (SHMED) program, was begun in 1981 by RSPA and is scheduled to end this year. Under SHMED, 25 States conducted programs funded by Federal contracts to strengthen State enforcement capabilities and promote uniformity in State hazardous materials safety regulations and enforcement procedures. Although all modes are covered by the program, highway transportation programs have been emphasized by many States. Training of enforcement personnel, especially for highway inspections, has been a major activity.

Initially, SHMED training involved a 2-week residential course at DOT's Transportation Safety Institute. However, this arrangement proved to be too expensive for the States; thus, RSPA's three-phase inspection and enforcement course was developed, and hazardous materials training within the States was offered. The train-the-trainer program at TSI was also initiated. By government standards, the SHMED program is small; by the time it expires, it will have expended only about $3 million. Nevertheless, it has been extraordinarily influential in shaping State enforcement activities and in determining the components of an effective program.

The second Federal grant program is the Motor Carrier Safety Assistance Program (MCSAP), which funds State enforcement and regulatory enforcement activities for highways. MCSAP is administered by the Bureau of Motor Carrier Safety. The thrust of the 5-year program is to help States enforce motor carrier safety regulations and increase safety inspections of intrastate and interstate commercial vehicles. General safety and hazardous materials activities are eligible for funding. Both development and implementation grants are available under MCSAP. To receive implementing funds, a State must develop an enforcement and safety program plan and designate a lead agency; set aside adequate resources to administer the program and enforce the regulations; and have statutory authority to enter vehicles and facilities. In addition to financial and regulatory development support, a basic 8-hour hazardous materials training course for State law enforcement personnel is offered by BMCS field staff. Actual appropriations for MCSAP have been lower than the amounts authorized; however, the maximum funding level of $50 million has been requested for fiscal year 1987.

The end of the SHMED program in 1986 means that Federal support of State multimodal hazardous materials enforcement capabilities will decrease. MCSAP will continue to provide States with funds for the highway mode, but monies are not targeted exclusively for hazardous materials inspection and enforcement activities. Without sustained Federal support, many States will be stymied in their efforts to develop or improve inspection, regulation, and enforcement for air, water, and rail modes of transportation. This prospect especially concerns States with high concentrations of nonhighway hazardous materials shipments. Even where State inspectors have been trained in rail safety procedures, they cannot conduct hazardous materials inspections, because authority to do so has not been granted to States.

Moreover, Federal grant programs have not provialed any direct support for local inspection and enforcement activities. Major metropolitan areas, responsible for enforcing Federal, State, and local regulations often turn to general revenues or permit, registration, or licensing fees to support their inspection and enforcement programs. (For more information on SHMED, MCSAP, and local requirements, see chapter 4.)

[22] Five seminars have been held since the program began in 1985 and were attended by 223 people. Theresa Yearwood, Science Applications International Corp., Oak Ridge, TN, personal communication, Apr. 11, 1986.

[23] Gerald Arenburg, Executive Director, National Association of Chiefs of Police, personal communication, July 1985.

State Inspections and Enforcement

Although some States, such as Maryland, Michigan, and Massachusetts, have taken steps to centralize hazardous materials inspection activities,[24] hazardous materials inspection authority in many States is divided among several agencies. Usually, the State Police or highway patrol is charged with roadside inspections, and another agency, such as the department of transportation, has authority to conduct inspections of terminals. In addition, a special agency may be empowered to inspect carriers of radioactive materials.

Systematic and consistent inspection procedures are important if widespread compliance with hazardous materials transportation regulations is to be achieved. A recent survey of 47 States, conducted by SHMED States, found that 42 States have established inspection procedures based on manuals or guidance provided by DOT, the Commercial Vehicle Safety Alliance (CVSA), or their own agencies.[25] Created in 1980, CVSA now includes 26 States and the Canadian Provinces of Alberta and British Columbia, and promotes the use of uniform truck safety inspection standards developed in cooperation with BMCS and RSPA.

However, violations of laws and regulations governing the transportation of hazardous materials are often treated differently from State to State and among different agencies in the same State. In about half of the States, inspectors have enforcement powers and can issue citations for violations. In the other half, inspectors can only report violations to a separate agency empowered to enforce regulations and assess penalties. Some States provide only for civil penalties; others give the enforcing agency the option of civil or criminal penalties depending on the severity of the violation and the violator's record. In some States, the policy is to issue written warnings to first offenders, while others use more stringent measures. Fines for similar violations also differ among the States.[26]

Enforcement officers report four problems commonly encountered in prosecuting hazardous materials violations. First, due to a lack of training or experience, officers often do not provide adequate documentation in the inspection report or have not followed correct procedures. As a result, many cases are set aside or the charges reduced. Second, enforcement officers find that many judges and local prosecutors have difficulty understanding hazardous materials regulations and respond by dismissing cases or lowering penalties without cause. A third problem is in obtaining assistance from other agencies in preparing evidence for court proceedings. State agencies are sometimes unwilling to cooperate in testing hazardous materials or in providing other technical assistance. In some instances, State facilities may be willing to help, but they cannot provide certain kinds of tests or technical analyses, or they cannot do so in a timely manner.[27] Fourth, State enforcement agencies complain that fines are too low to serve as a deterrent to noncompliance. Many carriers and shippers treat fines as a cost of doing business.[28]

State Training Programs

Although training programs sponsored by the Federal Government have increased the number of State inspectors trained in hazardous materials, there are still disparities among the sizes and capabilities of State inspection forces. Three examples of strong State enforcement training programs are described in box 5B. However, few other States have such extensive training programs. Moreover, training for local enforcement officers is limited. In some States, local officers attend State police academies, but they may not receive hazardous materials training.

According to the 1985 SHMED survey of 47 States, 36 States conduct hazardous materials train-

[24] U.S. Congress, Office of Technology Assessment, *Transportation of Hazardous Materials: Stare and Local* Activities, OTA-SET-301 (Washington, DC: U.S. Government Printing Office, March 1986), p. 22.

[25] Inspection procedures were based on Motor Carrier Safety Assistance Program guidance in 25 States, on Commercial Vehicle Safety Alliance guidance in 21 States, and on Research and Special Programs Administration guidance in 6 States. Fourteen States indicated that they developed their own procedures. U.S. Department of Transportation, State Hazardous Materials Enforcement and Development (SHMED) program, Hazardous Materials Enforcement Survey, results summarized in the State of New Hampshire, Department of Safety Report, Sept. 30, 1985. The survey was compiled at the spring 1985 SHMED Conference in Charleston, WV.

[26] U.S. Congress, op. cit., p, 23.

[27] Captain Richard Landis in U.S. Congress, Office of Technology Assessment, "Transcript of Proceedings–OTA Workshop on State and Local Activities in Transportation of Hazardous Materials," unpublished typescript, May 30, 1985.

[28] National Conference of State Legislatures, *Hazardous Materials Transportation—A Legislator's Guide* (Denver, CO: 1984), p. 36.

Box 5B.—Case Studies of State Training Programs

Several States have developed notable enforcement training programs. The following case studies illustrate some of the achievements of California, Maryland, and Illinois.

California.—The California Highway Patrol (CHP) conducts a comprehensive State training program, during which uniformed CHP inspection officers attend a 20-week basic law enforcement training course on hazardous materials inspection procedures at the CHP Academy. Officers are then assigned to field commands where they receive 30 days of training from veteran CHP inspectors. In addition, officers receive periodic refresher training throughout the year at their field headquarters and return to the academy every 3 years for in-service training. CHP officers assigned exclusively to commercial enforcement duties at inspection and scale facilities and on mobile units are selected from veteran inspection officers. They attend an 80-hour commercial enforcement class at the academy, with retraining every 2 years. Civilian inspectors assigned to CHP inspection duties must have at least 1 year of experience in the maintenance of heavy-duty commercial vehicles. They attend the 80-hour enforcement class at the Academy and receive additional in-service training every 2 or 3 years. CHP also provides training for other State agency personnel involved in hazardous materials management and for employees of the regulated industries. Two-day hazardous materials seminars are conducted as needed for these groups.[1]

Maryland.—Maryland has developed a well-trained inspection force. The State has fully utilized the Transportation Safety Institute's (TSI) outreach activities, sponsoring three courses with about 50 students enrolled in each. The first group of officers to be trained were drawn from select units of the State Police Truck Enforcement Division that patrols major Interstate highways. After the officers had completed the course conducted by TSI onsite in Maryland and were ready for field work, they received 2 months of on-the-job training under the supervision of Federal hazardous materials inspectors from the Bureau of Motor Carrier Safety and the Research and Special Programs Administration. During this time, roadside inspections were performed, but only warnings, not citations, were issued. State officials used this grace period to contact the Maryland Motor Truck Association and major independent truckers to inform them of Maryland's hazardous materials regulations and enforcement program and to solicit voluntary compliance. Maryland officials feel the grace period enabled novice inspectors to gain experience and allowed hazardous materials carriers time to adjust to the new regulatory requirements.

Illinois.—Before 1977, Illinois had no central regulatory agency responsible for hazardous materials transportation and no State enforcement program. Once a study identified these deficiencies, the legislature authorized the Illinois Department of Transportation (IDOT) to regulate the transportation of hazardous materials on the highways and gave the State Police enforcement power. Training of State Police officers was a key component in the enforcement program. Initially, 72 officers were trained in basic hazardous materials inspection and cargo tank inspection at TSI in Oklahoma City. As the State program developed, IDOT set up its own 3-week basic training program and began offering regularly scheduled refresher courses. Both the basic training and refresher courses focus on the regulations, procedures for conducting inspections, and methods of preparing a case for prosecution. During training, case studies are presented to demonstrate successful and unsuccessful techniques. Training also emphasizes use of standard equipment issued to on-the-road inspectors for detection and recording of violations, and for personal safety, such as cameras; binoculars; vehicular-mounted detection and surveillance apparatus; explosive meters; and protective footgear, coveralls, and masks. IDOT attorneys and industry representatives participate in the training program to ensure that as many affected parties as possible are kept informed.[2]

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[1] U.S. Department of Transportation, [illegible] Proceedings," unpublished typescript, 1983, p. 126.

[2] U.S. Congress, Office of Technology Assessment, [illegible] of Hazardous Materials: State and Local Activities, OTA-SET-301 (Washington, DC: U.S. Government Printing Office, March 1986).

ing. The DOT/FEMA survey found that training for compliance or enforcement, including courses that combined compliance, enforcement, and/or response training, is offered by State and local governments in 38 States and the District of Columbia.*

The SHMED survey also found that of the 36 States that conduct training, 32 offer basic hazardous materials compliance and enforcement courses. Other course offerings include cargo tank compliance, radioactive materials, and advanced hazardous materials training. However, 31 States indicated that existing hazardous materials training was not adequate to meet their needs. Four areas where additional training is needed were identified: radioactive materials, hazardous wastes, cylinders, and explosives.

Another finding of the SHMED survey was that 31 of 36 States use the three-phase training course format developed by TSI Moreover, through TSI, train-the-trainer networks have been established to further Federal training within States; California, Delaware, Idaho, New Hampshire, South Carolina, and Vermont now offer train-the-trainer courses.

A recently established network of trainers is the National Alliance of Hazardous Materials Instructors, an organization affiliated with CVSA. The National Alliance, formed in November 1985, was initiated by personnel who attended TSI train-the-trainer courses and who were experienced in hazardous materials transportation inspections and enforcement. The National Alliance plans to function as a trainers' network with the aim of disseminating information on hazardous materials transportation, providing uniform enforcement and inspection training, and developing expertise on hazardous materials transportation regulations.[29]

*Differences in methodology and data between the State Hazardous Materials Enforcement Development (SHMED) and U.S. Department of Transportation/Federal Emergency Management Agency (DOT/FEMA) surveys resulted in somewhat different findings. For example, while the SHMED data shows that Michigan and West Virginia provide training, agencies from those States did not participate in the DOT/FEMA survey. In addition, only response training was identified for some States in the DOT/FEMA survey, even though the same States responded positively to the SHMED survey; these States include Georgia, Kansas, Kentucky, Florida, and New York. Because of these inconsistencies, the Office of Technology Assessment is using the results of the SHMED survey, which are more complete.

[29]Sergeant John Currie, National Coordinator, National Alliance of Hazardous Materials Instructors, personal communication, Nov. 5, 1985; and statement of Paul R. Henry, President, Commercial Vehicle Safety Alliance to the State Hazardous Materials Enforcement Development Workshop, Salt Lake City, UT, August 1983.

A desire to participate in regional training has also been expressed by 43 States. According to the SHMED survey, 23 States indicated that they were already involved in informal regional training, and 27 States said that they made their training courses available to other States. For example, although New Jersey was not a SHMED State, its enforcement officers participated in Maryland SHMED training programs. Funding for enforcement training is provided by the Federal Government or the States, or some combination thereof. Most States (32 out of 36) indicated that they do not charge a fee for their training courses.

Some States have also taken steps to educate shippers and carriers within their jurisdictions. As a matter of policy, Maryland regularly informs the trucking industry about regulations and enforcement practices. The State Police there have developed a training program for commercial carriers, and officers hold frequent meetings with industry groups. Whenever an inspector cites a truck for a violation, the State Police department sends a copy of the traffic safety report to the Maryland Truck Association for forwarding to the truck company. In this way, the company is notified of the violation in time to take whatever corrective action may be needed on other trucks in their fleet.[30] The California Highway Patrol offers self-inspection and compliance seminars at no cost to participating companies. In addition, through its registration program, California is able to notify shippers and carriers of changes to the hazardous materials regulations. Illinois postponed implementation of its enforcement program for 2 years to allow industry to assimilate the regulations and move toward voluntary compliance. Compliance training for the trucking industry is also offered by State Police in New York and New Hampshire.[31]

Conclusions and Policy Options for Enforcement Training

The number, frequency, and variety of hazardous materials shipments by all transport modes and the importance of preventing potential environmental and health damage make essential strong

[30]Maryland Department of Mental Health and Hygiene, "SHMED Quarterly Report, April-June 1984," unpublished report filed with the U.S. Department of Transportation, 1984.

[31]U.S. Congress, op. cit., p. 24; and National Conference of State Legislatures, op. cit., p. 72.

Federal and State inspection forces and adequate training of those forces. Despite the need, DOT inspection and enforcement teams have been significantly reduced in size over the past 5 years, and Federal inspectors visit only a small fraction of the total number of shippers, carriers, and container manufacturers in a given year. Furthermore, appropriations for increased numbers of Federal enforcement personnel have not been forthcoming.

Federal inspection and enforcement forces are well trained but limited in number, making State enforcement activities very important for all modes, but particularly for highway transport. Some Federal training programs, particularly those sponsored by DOT, are directed at improving State capabilities. However, despite increased Federal training assistance, State inspection forces still vary greatly in size and skill, and States indicate a clear need for additional training, especially for enforcement of regulations governing radioactive materials and hazardous wastes.

The SHMED program assisted many States in developing consistent enforcement training programs, using successful and relatively inexpensive training methods such as train the trainer. Additional enforcement training courses for State and local employees, provided by RSPA at DOT's Transportation Safety Institute and State locations, have also been valuable. OTA finds that the hazardous materials enforcement training and train-the-trainer courses taught by TSI provide good models for the development of State programs. The TSI program is a valuable resource, providing standardized training course development; it deserves continued support. In addition, DOT, EPA, and NRC could make existing training courses and materials on hazardous wastes and radioactive materials available to State and local governments in need of them.

However, financial support for inspection and enforcement programs, including training, is needed according to State and local officials contacted by OTA. Several options for additional financial assistance are available to Congress. Funding for the SHMED program could be extended so that the program could be made available to those States that have not yet participated and wish to develop hazardous materials enforcement teams with multimodal expertise.

Direct financial support for inspection and enforcement activities undertaken by local jurisdictions could also be considered. Currently, some local jurisdictions collect permit or license fees from carriers of hazardous materials to fund their enforcement programs. Another option would be to ensure that a portion of the funds provided to the States be directed to those localities that have or would like to develop enforcement capabilities. State and local governments might also be encouraged to develop joint training programs; local law enforcement officers could participate in TSI courses given at State agencies, and State inspectors that participate in train-the-trainer programs could work with local governments.

The specialized expertise required for inspecting container manufacturers indicates that responsibility for such activities might best be left with the Federal inspection forces. Current levels of inspection and enforcement in this area are not adequate. Congress might consider increasing funding levels for DOT's enforcement program.

PART II: EMERGENCY RESPONSE ACTIVITIES AND TRAINING

Developing hazardous materials emergency response capabilities so that communities across our Iarge and diverse Nation feel adequatel, protected is a formidable task. The identification of available training programs, in the survey by the Department of Transportation and the Federal Emergency Management Agency, is a preliminary step toward developing a national strategy for improving emergency response training. While this survey and numerous other studies of training programs document a spectrum of public and private training courses, defining the needs of both first responders and ad-

vanced response personnel and establishing a systematic approach to meeting those needs are tasks yet to be undertaken.

Historically, Federal emergency management assistance programs for States and communities, administered by FEMA, have been largely directed at improving civil defense and natural disaster preparedness. However, despite common elements, planning for a hazardous materials accident and for nuclear attack are quite different. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 provides the authority for Federal emergency response, and well-trained Federal emergency response teams are available to assist when major hazardous materials disasters occur. However, little Federal action was taken until after the 1984 tragedy in Bhopal, India, to assist in the development of local response capabilities for the day-to-day risks posed by hazardous materials in communities.

Development of coordinated and comprehensive emergency response capabilities at the State and local levels has been hampered in the past by disinterest or low awareness; more recently, lack of funding and the fragmentation of responsibility and authority at the Federal, State, and local levels of government have proven difficult obstacles to overcome. However, documentation of the connection between the involvement of hazardous materials in a fire or accident and injury rates can trigger the development of training programs for emergency personnel. For example, in Ohio, after a computerized fire reporting system identified a significant number of injuries to fire personnel responding to emergencies involving hazardous materials, the State developed a special hazardous materials training program for firefighters.

Jurisdictions that have experienced serious hazardous materials accidents or have large chemical plants are likely to be directly concerned about developing and maintaining local emergency response capabilities. However, communities of all sizes are becoming aware of the dangers associated with the use and transportation of hazardous materials and are looking for ways to lower their risks. While large metropolitan areas may already have specially trained and equipped teams, in rural communities hazardous materials emergency response usually is an additional duty assigned to the fire or police department. A 1985 FEMA survey of 3,107 local emergency management organizations indicates that transportation accidents involving hazardous materials are major concerns of local governments (see table 5-7),[12] since serious injuries or fatalities may occur if responders lack appropriate training.

Emergency response training is offered by the Federal Government, States, local jurisdictions, industries involved in the manufacture or transport of hazardous materials, professional associations, and educational institutions. However, this diffuse shouldering of responsibility has resulted in emergency response training that varies widely in content and quality and often does not reach those most in need of it, rather than in comprehensive coverage and nationally accepted, standardized levels of training.

Federal Emergency Response Activities

Federal emergency preparedness and response is coordinated by the National Response Team (NRT) under the National Oil and Hazardous Substances

[12]Federal Emergency Management Agency, *Hazard Identification, Capability Assessment, and Multi-Year Development Plan (HICA/MYDP)* (Washington, DC: spring 1985).

[11]The reporting system found that 116 injuries in a single year were incurred at hazardous materials accidents. Chief Don Ryan, Ohio Fire Academy, Hazardous Materials Bureau, personal communication, Apr. 8, 1986.

Table 5-7.-The Ten Hazards Perceived as Most Significant by Local Jurisdictions

Hazard	Number of jurisdictions
1. Nuclear attack	[a]
2. Hazardous materials—highway incident	2,791
3. Winter storm	2,569
4. Flood	2,206
5. Hazardous materials—rail incident	2,188
6. Tornado	2,162
7. Hazardous materials—stationary incident	2,026
8. Urban fire	1,877
9. Wildfire	1,519
10. Hazardous materials—pipeline incident	1,509

[a]All jurisdictions are subject to the effects of nuclear attack.

SOURCE: Jurisdiction responses to Federal Emergency Management Agency, Hazardous Incident Capability Assessment Multi-Year Development Plan, 19S5.

Contingency Plan.[34] Composed of representatives of 12 Federal agencies with major environmental and health responsibilities, NRT is chaired by the Environmental Protection Agency; the U.S. Coast Guard serves as vice-chair.[35] Thirteen Regional Response Teams formed by regional representatives of NRT agencies and States, provide the regional mechanism for emergency response planning and for coordinating technical assistance during response actions. If State and local governments cannot handle a severe hazardous materials facility or transportation accident or request Federal intervention, EPA and the Coast Guard will assume control and direct Federal emergency response activities.

EPA has also established an Environmental Response Team based in Edison, New Jersey, that has provided various degrees of management or technical support for more than 500 incidents since 1978. The Environmental Emergency Response Unit is a highly specialized technical team sponsored by the Environmental Response Team and other EPA offices that is available to provide onsite assistance. In addition, the Coast Guard operates and maintains Strike Teams on the Atlantic, Pacific, and Gulf coasts for emergency response activities. The Strike Teams have sophisticated equipment for containing, skimming, and removing oil. The Coast Guard also operates the National Response Center for DOT as the point of contact for transportation releases of hazardous materials. During hazardous materials emergencies, scientific advice is provided to the Coast Guard by the National Oceanic and Atmospheric Administration's special hazardous materials group in Seattle, Washington.

While DOT's Research and Special Programs Administration does not respond to hazardous materials transportation accidents, it publishes and distributes the most widely available response information resource, the *Emergency Response Guidebook*.[36] The *Guidebook* contains basic response and first aid information for those who are first to arrive at the scene of an accident and who have not received extensive hazardous materials training; identification numbers that must be marked on packages and bulk containers correspond to the information in the *Guidebook*.[37]

In case of radiological accidents, primary Federal responsibility is shared by FEMA, NRC, DOE, and DOT. These agencies and others are represented on the Federal Radiological Preparedness Coordination Committee, an organization formed in 1982 by FEMA.[38] The Coordinating Committee has 10 Regional Assistance Committees throughout the country to help State and local governments develop emergency plans.[39] NRC and DOE maintain authority for planning and program development for emergency response, notification, technical assistance and advice, and involvement in response activities for radiological spills.[40] In addition, DOE

[34]The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 expanded the scope of the National Contingency Plan, originally established under the Clean Water Act to address oil spills, to include hazardous substances, 42 U.S.C. 9605. The National Contingency Plan is published in the Code of Federal Regulations at 40 CFR 300.

[35]Other participating agencies include the U.S. Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Interior, Justice, Labor, State, Transportation (the U.S. Coast Guard and the Research and Special Programs Administration), and the Federal Emergency Management Agency. Other Federal agencies, such as the U.S. Nuclear Regulatory Commission, participate on an ad hoc basis.

[36]U.S. Department of Transportation, 1984 *Emergency Response Guidebook,* DOT P 5800.3 (Washington, DC: 1984).

[37]However, first responders must be trained to use the U.S. Department of Transportation (DOT) *Guidebook* properly. For example, on Oct. 15, 1982, an accident in Odessa, DE, between a pickup truck and a tank truck resulted in a rollover of the tank truck and the release of 150 gallons of divinyl benzene (DVB), a moderately toxic material when inhaled. The truck carried a "combustible" placard. Approximately 100 emergency response personnel eventually responded to the accident, but only some had previous experience or training in handling a hazardous materials accident. The emergency responders who consulted the DOT *Guidebook* to determine appropriate procedures followed the instructions for divinyl ether, the only "divinyl" entry, because DVB was not listed by name; the correct procedure would have been to follow the instructions for combustible materials. The lack of training in this case resulted in injuries to 48 emergency response personnel.

[38]See 44 CFR 351, 47 F.R. 10759, Mar. 11, 1982.

[39]The Federal Radiological Emergency Response Plan (FRERP), 49 F.R. 35896, Sept. 12, 1984, covers any peacetime radiological emergency occurring within the United States that could require a significant response by several Federal agencies. Emergencies at nuclear facilities and during the transportation of radioactive materials fall within the scope of the plan. FRERP was published as an operation plan on Nov. 8, 1985 (50 F.R. 46542) along with concurrences by each of the 12 agencies that participated in its development. A guidance document for State and local government emergency response planning for the transportation of radioactive materials has also been published by FEMA; see Federal *Emergency Management* Agency, *Guidance for Developing State and Local Radiological Emergency Response Plans and Preparedness for Transportation Accidents, FEMA-REP-5* (Washington, DC: March 1983).

[40]A Memorandum of Understanding between the Federal Emergency Management Agency and the U.S. Nuclear Regulatory Commission was published on Apr. 18, 1985 (50 F.R. 15485).

maintains 30 regional response teams for radiological incidents. *

State and Local Emergency Response Activities

State authority for hazardous materials emergency response is, like that of the Federal Government, fragmented; it may rest with a State fire marshal's office or State departments of health, transportation, environment, radiological affairs, or civil defense—or, more likely, a combination of some or all of these. Just as the statutory authority for emergency response varies from State to State, so does the interest emergency response generates within the State government. States that are highly industrialized, heavily traveled, confronted with exceptional hazards (such as a large number of waste disposal or nuclear facilities, or a heavy concentration of chemical industries), or have experienced a serious hazardous materials accident are more likely to encourage and support the development of emergency response planning and training and attempt statewide coordination. Emergency response planning is discussed in appendix C.

Because they are convinced that State assistance may be the best or even the only way of protecting rural areas in hazardous materials accidents, some States, including Delaware, Indiana, Oregon, and Tennessee, are developing statewide emergency response plans. For example, the Tennessee Emergency Management Agency (TEMA), in an effort to assure rural areas of adequate hazardous materials emergency response, divided the State into six districts, each with a district coordinator and equipped with a special response van. The district coordinators are trained by the TEMA training institute and must be recertified for hazardous materials response every 2 years. Their multiple responsibilities include training responders in their districts. As a result, Tennessee has more than 2,000 State-certified hazardous materials responders.[41]

Photo credit: Hazardous Materials Bureau, Ohio State Fire Marshal's Office

Training for hazardous materials response includes learning how to don and secure personal protective equipment.

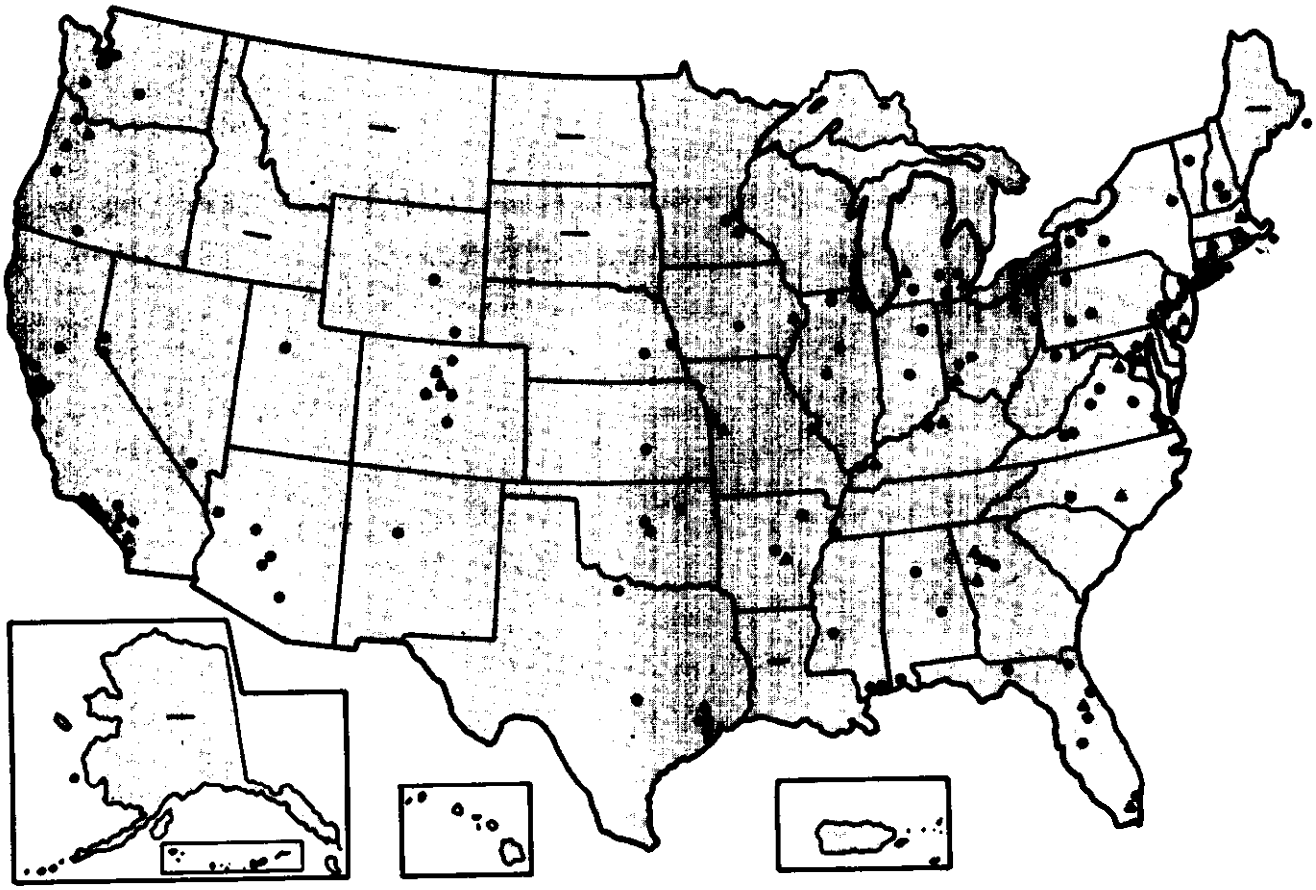
The same factors that influence State emergency response development also operate at the local level, and communities with emergency response capabilities have set up a wide variety of response systems. In rural communities, responsibility-for hazardous materials emergency response usually lies with the fire or police department. In contrast, in major metropolitan and urban areas, many public safety officers, primarily firefighters and emergency service organizations, have developed or are developing special competence to respond to hazardous materials accidents. These areas are usually transportation hubs and major manufacturing centers that handle large movements of industrial raw materials, gasoline, and fuel oils. Figure 5-1 shows hazardous materials teams, identified by a study performed by the International Association of Fire Chiefs.[42] Many of these teams are located in regions of the country where there are heavy concentrations **of** chemical plants and transportation corridors (see figure 5-2).

*Other U.S. Department of Energy and U.S. Department of Defense response teams, primarily responsible for nuclear weapons incidents, are available to provide assistance for other accidents involving radioactive materials.

[41]George Kramer, Hazardous Materials Instructor, Tennessee Emergency Management Agency, personal communication, Nov. 26, 1985.

[42]International Association of Fire Chiefs survey of local response teams, July **1985.**

Figure 5-1 .—Public Hazardous Materials Response Teams



● - County response teams
● - City/town response teams

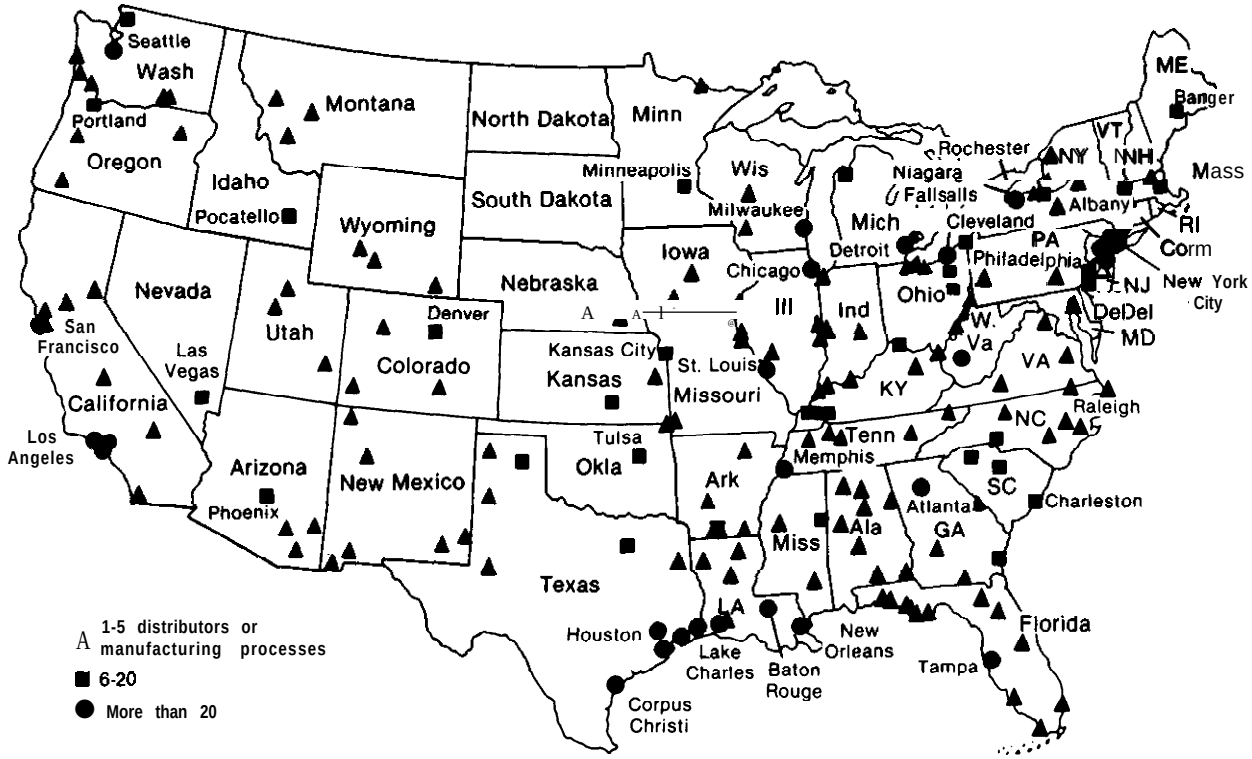
SOURCE: International Association of Fire Chiefs (IAFC) survey and OTA Staff,

Local governments often find it difficult to justify the expense of specialized equipment, training, and manpower for events that occur rarely. Response teams in metropolitan areas are usually financed by general revenues or permit and fee systems; training and equipment may also be provided by industry. The hazardous materials team of the Houston fire department was organized in 1978 using a $7,000 grant from the city and a renovated truck; local industry initially sponsored training for the team. Within a year, the team had developed sufficient expertise to provide basic training for fire department personnel. Industry continues to provide specialized training for tank trucks and railcars, and donates equipment for demonstration purposes. In 1986, the city of Houston budgeted $98,000 for the hazardous materials team in addition to salary and equipment maintenance expenses.[43]

A series of incidents involving hazardous materials prompted the development of a special hazardous materials response team 6 years ago in Santa Clara, California. With support from the Chamber of Commerce, the fire department surveyed fixed facilities to determine the type and volume of hazardous materials stored in the county. A license and fee system based on the inventory information was established to support hazardous materials training for paid and volunteer firefighters and *purchase* equipment. Three chemists are now employed by

+] Max MacCrae, Chief, Hazardous Materials Teams, Houston Fire Department, personal communication, Apr. 28, 1986.

Figure 5=2.-The Chemical Plants: Where They Are
(places where very toxic chemicals are handled)



SOURCES: Environmental Protection Agency, SPN Directory of Chemical Producers, Chemical Week Buyers Guide, Chemsources U S A , Individual Chemical Companies.

the fire department to conduct the training courses and to educate local businesses on the proper storage and handling of chemicals.[44]

Small urban and rural areas are much less likely to have the resources or the experienced manpower to respond appropriately to hazardous materials accidents and are less likely to be aware of the dangers of these accidents. The need for training in these areas seems less pressing, because hazardous materials transportation accidents are less likely to occur. However, when an accident does occur, the lack of trained personnel escalates the risk at the site and within the surrounding community.

Developing and maintaining a regional hazardous materials response team is a cost-effective possibility for smaller jurisdictions. Coalitions of several communities or of industry and local government may be able to provide specialized equipment and response capabilities even for areas with severe financial constraints. Industry participation may lessen the cost to local communities and provide a level of technical expertise in hazardous materials handling, chemical knowledge, and personnel protective equipment that is often beyond local capabilities. The cost of emergency response equipment and the difficulties faced by those who must select such gear are discussed in box SC.

Industry Emergency Response Activities

Over the past decade, hazardous materials manufacturers have evaluated their safety programs and often taken steps to address their own and the public's concerns. Industry's involvement in hazardous materials emergency response ranges from technical assistance to specialized response teams. The best

[44]The 1986 budget for the chemical division of the Santa Clara Fire Department, generated by the license and fee program, is $286,000. Larry Monette, Santa Clara Fire Department, Santa Clara, CA, personal communication, Apr. 28, 1986.

Box 5C.-Emergency Equipment

Emergency response equipment is the primary protection and defense for first responders handling hazardous materials. The equipment must be adapted to a particular hazard in that it must be made of materials that are resistant to the hazardous chemical; and it must protect those areas and functions of the human body susceptible to the hazard.[1]

The lack of useful information on the appropriate type of personal protective equipment and procedures for its use is a major concern for local governments and emergency service personnel. Indeed, firefighter gear is only now being tested for chemical resistance. Firefighters and hazardous materials response teams currently rely on fire service literature, manufacturers information, and accumulated personal expertise when selecting chemical protective gear. However, if a community identifies the hazardous materials manufactured, stored, and transported through its jurisdiction, equipment selection can be made based on this information.

The appropriate choice among the varieties of equipment offered and the numerous operating procedures available depends on the hazardous materials being handled, and those responsible for equipment purchase are faced with difficult and expensive options. The factors to be considered prior to purchasing protective clothing include: the initial cost of the clothing; chemical protection capabilities of the construction material; ease of testing, use, maintenance, and decontamination; and durability and reliability of the suit.[2]

Personal protective equipment is currently made of a variety of materials that differ in terms of chemical resistance and durability. Butyl rubber, polyvinyl chloride, and vitron are the three most common materials used:[3]

- Butyl rubber is resistant to gas permeation and can be used with almost anything except chlorinated, aliphatic, or aromatic solvents.
- Polyvinyl chloride is considered excellent for use with acids and bases, and is also good for use with most organics except chlorinated and aromatic solvents. However, it allows some permeation by organics and retains some absorbed material.
- Vitron is resistant to most organics including chlorinated hydrocarbons and solvents except oxygenated solvents, such as alcohols, aldehydes, ketones, esters, and ethers.[4]

The cost of protective suits ranges from less than $100 for a disposable coverall to approximately $2,000 for a chemical splash suit with inner and outer suit protection. Self-contained breathing apparatus, important for incidents involving unknown chemicals or known highly hazardous chemicals, may cost $1,400 each.

Equipment must fit properly, be used correctly, and be maintained appropriately if it is to provide effective protection. In the course of their activities, firefighters and other emergency responders will be exerting themselves, altering the fit and possibly reducing the effectiveness of clothing and respirators. For these reasons, emergency responders must be provided with training and explicit guidelines on the purchase, use, and maintenance of protective equipment.

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[1] A.D. Little Co., "Protective Clothing and Equipment," *Chemical Hazard Response Information System (CHRIS)* *Response Methods Handbook* (Washington, DC: U.S. Coast Guard/U.S. Department of Transportation, December 1978), p. 7-1.

[2] Proceedings of a meeting of Federal and local o&i& sponsored by the U.S. Fire Administration, Federal Emergency Management Agency, and Public Technology Inc., unpublished typescript. Washington, DC, August 1984.

[3] International Society of Fire Service Instructors, Chemical Encapsulating Suit Committee, unpublished survey, June 1985.

[4] U.S. Environmental Protection Agency, Edison, NJ, unpublished emergency response training information, January 1986; and A.D. Little Co., op. cit.

known effort is the Chemical Transportation Emergency Center (CHEMTREC), established in 1970 by the Chemical Manufacturers Association (CMA). CHEMTREC maintains an online database on the chemical, physical, and toxicological properties and health effects of the thousands of products of the member companies. CHEMTREC staff provide chemical information for use in onsite decisionmaking and notify the manufacturer of an accident involving its product. CMA has also developed CHEMNET, a mutual aid network of chemical shippers and for-hire contractors, to advise and assist at chemical spills during transportation. Figure 5-3 shows locations of CHEMNET emergency response teams.

Many large petrochemical and chemical manufacturers train and maintain company emergency response teams for both their fixed facilities and transportation accidents. A team may respond itself to a report of an accident involving a company product or, under formal agreements, may request another participating company closer to the incident to respond. Industry teams observed by OTA are instructed to defer to the local on-scene commander at an accident, so that the emergency response effort remains coordinated.[45]

A recent effort, the CMA's Community Awareness and Emergency Response Program, encourages industry and community cooperation in the development of emergency response plans. A successful example was an evacuation drill of several Philadelphia neighborhoods located near industrial facilities, sponsored by the city and two chemical companies in October 1985. More than 600 people, out of approximately 2,000 residents, participated in the exercise, and the emergency response plan for the area was revised as a result of the drill.[46]

The Channel industries in Houston, Texas, the Pesticide Safety Team Network, and Chlorep are other examples of emergency response capabilities provided by industry .47 The Channel industries, a concentration of chemical facilities along the Texas Channel, have extensive mutual aid agreements with each other. By pooling their resources, these industries can assemble 500 firefighters and other trained personnel and equipment, including power generators for rapid response to an accident. Finally, a nuclear power industry group, The Institute for Nuclear Power Operations, has established a voluntary agreement including 42 utilities to provide assistance to another utility in the event of a radioactive materials transportation accident. *

Emergency Response Training

The population in need of hazardous materials emergency response training is widely distributed and varied. A major segment of this population includes paid and volunteer firefighters. * Volunteers comprise 85 percent of the firefighter population, while the remaining 15 percent are paid employees of municipal, county, or local governments.[48] Of this large number of volunteers, it is estimated that 25 percent, or roughly 255,000 firefighters, leave the fire service each year.[49] Police officers are the second largest group involved in emergency response. In small urban and rural areas, police officers may serve both as enforcement officers, checking for violations of hazardous materials and other safety regulations, and as first responders to transportation accidents involving hazardous materials.

In addition, health professionals and civil defense or emergency management personnel may be required at the scene of hazardous materials accidents. There are approximately 400,000 basic emergency

[45] Shell Oil Co., Mid. Continent Distribution Area, Response Action Team Training, June 1985.

[46] The companies involved were Rohm & Haas and Allied Chemical. Phil Stefanini, Rohm & Haas, Philadelphia, PA, personal communication, Apr. 22, 1986.

[47] Pesticide Safety Team Network and Chlorep are both specialized information and response units formed by manufacturers of pesticides and chlorine products. Like CHEMNET, participating industries respond, coordinate response, or arrange contractor response to transportation accidents involving their products. Lawrence Norton, National Agricultural Chemical Association, personal communication, Aug. 30, 1985.

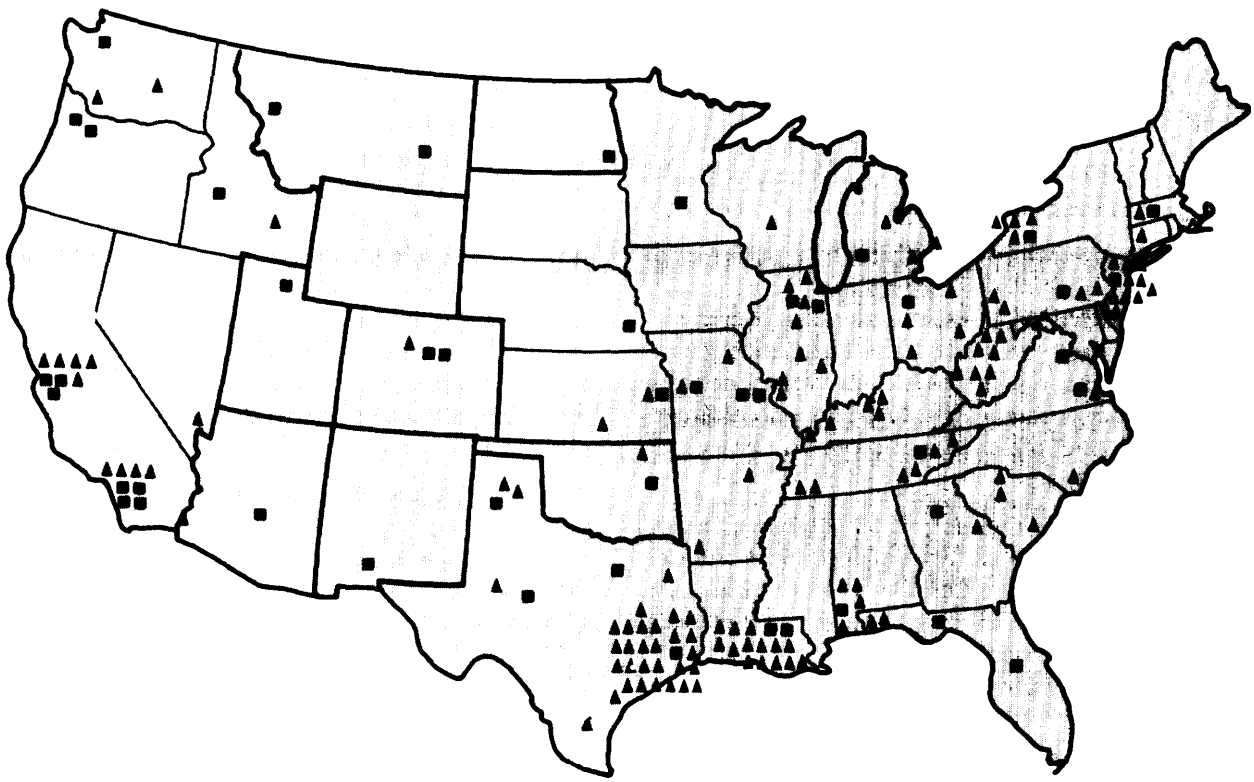
*The Institute for Nuclear Power Operation (INPO) is a nonprofit organization formed by electric utilities in 1979 after the Three-Mile Island accident. INPO establishes industry standards for the operation of nuclear powerplants, including personnel and training standards.

*Call firefighters are part-time paid firefighters who are considered part of the volunteer force for statistical purposes.

[48] As of December 1985, the International Association of Fire Fighters (IAFF) estimated the total fire service population to be 1,034,394 persons. Of this population, 884,600 are volunteers or call firefighters. The remaining 149,794 are paid or career firefighters. The National Fire Protection Association (NFPA) estimates the paid or career fire service population is 226,600 persons and agrees with IAFF figures on volunteer firefighters. Carl Peterson, NFPA, Quincy, MA, personal communication, December 1985.

[49] Chief Warren Isman, Fairfax County Fire Department, VA, personal communication, November 1985.

Figure 5-3.—CHEMNET Emergency Response Team Locations



▲ CHEMNET chemical industry emergency response teams
■ CHEMNET contractor emergency response teams

SOURCE. Chemical Manufacturers Association

medical technicians, [50] and there are about 6,500 civil defense and emergency management personnel. Employees of State and local public works, environmental health and emergency preparedness agencies, and health care facilities may also be called on to handle hazardous materials emergencies.

Some of these groups have received training in hazardous materials response pertinent to their area of expertise—for example, emergency room physicians and nurses receive training in detoxification procedures, and civil defense workers receive training in radiological response. However, few receive training in hazardous materials response, and many are unequipped to handle victims of transportation accidents or first responders who suffer effects of exposure.[51]

Of this total population, OTA estimates that 1.5 million have not received any hazardous materials training or may be in need of specialized training. Of particular importance is training for the first line of response at a hazardous materials transportation accident—firefighters, police, and emergency medical personnel. What constitutes appropriate response training, who should receive it, and how it should be funded are subjects of intense debate.

[50] Morando, op. cit.

[51] A survey of New Jersey hospitals conducted by the Workers Policy Project in November 1985, found area hospitals unprepared for chemical emergencies. Of the 32 hospitals surveyed in seven counties in northern New Jersey", less than one-quarter of the emergency rooms had a protocol for chemical emergencies, one-half had a single physician in the emergency room during the daytime, and two-thirds had a single physician in the emergency room at night. Most of the hospitals reported they would be unable to treat more than 20 critically ill patients at one time. Steven Markowitz, et al., *Ability of Health Care Facilities in Northern New Jersey To Respond to Major Chemical Accidents (New* York: Workers Policy Project, November 1985), p. 3; and Stuart Diamond, "Hospitals Found To Be Ill-Prepared for Toxic Spill in New York Area," *The New York Times,* p. AI, Dec. 4, 1985.

Local elected and public safety officials responsible for the safety of the community feel strongly that adequately trained and equipped emergency response personnel are necessary. At a minimum, they believe that first responders must know how to identify hazardous materials, understand the differences between chemical emergencies and standard firefighting, and be able to alert appropriate officials and more sophisticated response teams if necessary.

High-quality training for specialized public and private hazardous materials response teams is also important. Advanced courses generally cover some elements of basic chemistry, the hazardous materials regulations, dangers posed by various chemicals and other commodities, response and cleanup procedures, and the use of specialized protective equipment.

Industry officials maintain that hazardous materials emergency response requires experience and expertise with the commodity involved and that they are in the best position to provide such assistance. However, when hazardous materials accidents occur in locations distant from transportation or manufacturing centers, industry assistance like that of the specialized Federal response teams described earlier is often not readily available.

Federally Sponsored Training

At the Federal level, a myriad of emergency response training programs are conducted by the Federal Emergency Management Agency, the Department of Transportation, the Environmental Protection Agency, the Department of Energy, and the Nuclear Regulatory Commission, among others. These programs, offered at both national and regional locations, are related to different aspects of hazardous materials emergency response, with each agency emphasizing its own area of responsibility. Although representatives of many of these agencies meet regularly as members of the National Response Team, strong Federal leadership in emergency response training has not yet been achieved. In 1985, NRT established a special training committee to identify problems, gaps, and duplicative activities and to recommend training programs and policy alternatives.

The Federal Emergency Management Agency

FEMA hazardous materials training activities include residential and field programs, train-the-trainer courses, and teleconferences. Training is offered by two organizations at the National Emergency Training Center in Emmitsburg, Maryland—the National Fire Academy (NFA) and the Emergency Management Institute (EMI). (See table 5-8.) NFA provides instruction on response tactics and procedures and the chemistry of hazardous materials, while EMI sponsors training that is oriented toward planning and policymaking activities. However, both NFA and EMI training programs only recently began to focus on hazardous materials.

The National Fire Academy trains State and local fire and rescue personnel through both field and resident programs.[52] Most State and local training officials contacted by OTA consider NFA courses and training materials to be extremely valuable. The resident training programs are 2 to 3 weeks in length and offer extensive training; nearly 2,000 students attended hazardous materials courses at the Academy between 1980 and mid-1985.

Shorter versions of the NFA resident training programs have been developed into field training programs; these are 16 hours long, and are designed to be offered in 3-hour segments for evening or weekend sessions for volunteer firefighters. Field training programs generally take 1 year to develop and undergo a 2-year field testing program before becoming final. Two NFA field training programs—''Hazardous Materials Incident Analysis" and "Hazardous Materials Pesticide Challenge' '—were reworked into train-the-trainer courses in July 1984. State and metropolitan fire department officials are trained as trainers by NFA and subsequently are provided with instructor guides and student manuals for further distribution.* Between July 1984 and December 1985, these programs reached more than 18,500 students in the field. In addition, an older field pro-

[52] National Fire Academy training is authorized under the Federal Fire Prevention and Control Act of 1974, Public Law 93-498.

*Metropolitan fire departments are those that serve populations greater than 200,000 people or have a firefighting force of greater than 400, paid and volunteer, and have centralized training.

Table 5-8.—Federal Emergency Management Agency Response Training

Agency and course	Hours per course	Students completing per year
Federal Emergency Management Agency:		
National Fire Academy		
Chemistry of Hazardous Materials	74	300
Hazardous Materials Tactical Considerations	69	300
Hazardous Materials Incident Analysis	16	7,866
Hazardous Materials: The Pesticide Challenge	16	1,475
Recognizing and Identifying Hazardous Materials	3	2,440
Emergency Management institute:		
Hazardous Materials Contingency Planning	36	80
Integrated Emergency Management Course: Hazardous Materials	36	100
Analysis of Hazardous Materials Emergencies	12	1,158
Hazardous Materials Workshop[a]	8	2,271
Fundamental Course for Radiological Officers	32	1,432
Radiological Monitoring Instructor Course	24	919
Fundamental Course" for Radiological Monitors	12	10,805
Radiological Monitoring Refresher Course	4	1,978
Radiological Officer Refresher Course	24	317
Fundamental Course for Radiological Response Team	32	1,368
Hospital Emergency Department Management of Radiation Accidents	9	431
Workshop: Radiological Emergency Preparedness	16	314
Hazardous Radiological Materials Transportation Course	16	256
Special Radiological Defense Seminar	16	208
Radiological Defense Operations Workshop	16	311
Mobile Radiation Monitoring Course	8	62
Radiological Defense Training for Emergency Workers	16	173
Radiological Defense Briefings	8	26
Radiological Emergency Response Organization (Nevada Test Site)	68	270

[a]Hazardous materials workshops are offered by Stales, with Federal Emergency Management Agency support

SOURCES U S Department of Transportation and Federal Emergency Management Agency, ''Report to the Congress Hazardous Materials Training, Planning, and Preparedness, " unpublished draft, 1986, and Jim Casey, National Fire Academy and Gerald Boyd, Emergency Management Institute, National Emergency Training Center, Emmitsburg, MD, personal communication with Off Ice of Technology Assessment staff, 1986

gram, "Recognizing and Identifying Hazardous Materials," was recently updated and shortened to 6 hours; 12,440 students were trained under this program from July 1984 to December 1985.[53] Training programs that have been given to State and metropolitan fire departments for train-the-trainer distribution are also available through the National Audio Visual Center.*

While EMI also conducts training programs, the majority of them are directed toward civil defense. Some flexibility is allowed by FEMA for States interested in offering workshops and more in-depth courses on hazardous materials. Indeed, States that receive training funds must use 80 percent of their training monies to send students to 22 specific FEMA courses, only 2 of which deal directly with hazardous materials. Thus, only 20 percent of FEMA funds are available for additional hazardous materials and other types of emergency training.[54] These funding restrictions exist because financial assistance for emergency management provided to States and local jurisdictions by FEMA is authorized under the Federal Civil Defense Act.[55] Funds obligated under this statute may be used to prepare for and respond to actual attack-related events or natural disasters, including manmade catastrophes. However, monies may be used for disaster preparedness "only to the extent that such use is consistent with, contributes to, and does not detract from attack-related preparedness. "[56]

Several EMI resident training courses address hazardous materials. One course, "Analysis of Hazardous Materials Emergencies," is a 12-hour basic awareness program conducted by State trainers using EMI

[53]Wayne Powell, National Fire Academy, National Emergency Training Center, Emmitsburg, MD, personal communication, Apr. 14, 1986.

*The National Audio Visual Center in Washington, DC, stores all federally supported audio visual training for publication, distribution, and sale.

[54]Federal Emergency Management Agency, "Draft Fiscal Year 1987 Comprehensive Cooperative Agreement Program Guidelines," unpublished typescript, February 1986.

[55]Federal Civil Defense Act of 1950, as amended, 50 U.S.C. App. 2251.

[56]44 CFR 302.7; and 44 CFR 312.

materials. Since 1985, when this course was first offered, 1,500 local officials have been trained. Two other courses are geared more towards emergency planning than first responder training. The target audience for one course, Integrated Emergency Management, is local officials; the purpose of the course is to provide an overview of hazardous materials regulations, incident decisionmaking, equipment, evacuation, media relations, and planning exercises. In addition, in early 1986, EMI introduced another hazardous materials planning course directed at State and local officials. The course was developed jointly with EPA and will be offered by both agencies.

In an effort to reach more first responders, FEMA is also sponsoring teleconferences several times a year on different aspects of hazardous materials emergency response. FEMA estimates these broadcasts initially reached more than 100,000 emergency response personnel and firefighters throughout the country .57 While many officials believe that this type of training is a poor substitute for classroom experience, personnel at the National Fire Academy say that the teleconferences will heighten awareness of hazardous materials for fire service personnel who have little or no training in hazardous materials response. According to FEMA, future teleconferences will focus on exercises that can be used by a community to plan for hazardous materials emergencies.

The Environmental Protection Agency

The Environmental Protection Agency conducts training for hazardous materials response through resident and on-the-road programs. Since the EPA training effort began in 1979, the number of Federal, State, local, and industry personnel trained has risen from 373 during 1979 and 1980 to more than 2,300 in 1985.[58] (See table 5-9.) Resident programs at Edison, New Jersey and Cincinnati, Ohio, include standard courses on decisionmaking, personnel protective equipment for response activities, and hazardous materials incident management. These courses and others are also offered at other sites throughout the Nation.

[57] Joseph Donovan, then Director of the National Fire Academy, Federal Emergency Management Agency, personal communication, Dec. 18, 1985.

[58] Thomas C. Sell, Training Coordinator, U.S. Environmental Protection Agency, personal communication, Dec. 18, 1985.

The Department of Transportation

Training given by the Department of Transportation modal administrations at the Transportation Safety Institute generally covers enforcement and compliance activities rather than emergency response and planning. However, the Coast Guard offers training in emergency response for hazardous materials spills and transportation accidents at its Yorktown, Virginia, Marine Safety School. The training is primarily intended for active and reserve Coast Guard personnel; however, limited numbers of personnel from other Federal, State, and local agencies may attend (see table 5-10).

Emergency response training is also offered by the Federal Railroad Administration through TSI; l-day seminars for fire and emergency service personnel are offered in locations throughout the United States. In 1984, 50 seminars reached 1,749 students, and in 1985, 84 seminars reached 2,600 students.[59] The Research and Special Programs Administration, which provides numerous hazardous materials compliance and enforcement courses at TSI, has offered emergency response training in the past. These courses were discontinued in 1983, as similar ones were available through FEMA.

In addition, DOT distributes, upon request, copies of its *Emergency Response Guidebook* and a brief guidance pamphlet for first responders.[60] DOT also distributes to every State a self-contained training program on responding to accidents involving radioactive materials.[61] The training program is intended for local fire, police, and ambulance emergency service personnel.

Other Federal Response Training

Other Federal agencies provide limited response training for hazardous materials transportation accidents. The Department of Energy offers emergency

[59] Frank Fanelli, Office of Safety Programs, Federal Railroad Administration, U.S. Department of Transportation, personal communication, Apr. 2, 1985.

[60] U.S. Department of Transportation, Research and Special Programs Administration, Materials Transportation Bureau, *Radioactive Materials Transportation Information and Incident Guidance,* DOT/RSPA/MTB-81/4 (Washington, DC: ND).

[61] U.S. Department of Transportation, Research and Special Programs Administration, Materials Transportation Bureau, *Handling Radioactive Material Transportation Emergencies,* DOT/RSPA/MTB-7917 (Washington, DC: July 1979).

Table 5-9.—Number of Students Attending EPA Courses, 1979-85

EPA courses	1979-8					Fiscal year 1982					Fiscal year 1983					Fiscal			984		Fiscal year 1985					Cumulative total
	EPA	FED	S/L	IND	TOT	EPA	FED	S/L	IND	TOT	EPA	FED	S/L	IND	TOT	EPA	FED	S/L	IND	TOT	EPA	FED	S/L	IND	TOT	
EPA Training Response Safety Decisionmaking Workshop											34	3	5	4	46	5	8	22	8	43	22	14	57	24	118	207
Incident Mitigation and Treatment Methods	7	5	5	8	45	2	4	20	6	32	22	59	59	29	69	9	34	75	13	131	26	58	189	32	305	682
Sampling for Hazardous Materials						11	3	50	6	70	57	17	9	7	2	3	5	30	7	92	4	30	179	21	271	743
Hazardous Evaluations and Environmental Assessment	1	2		3	17	10		2	1	45	39	30	5	6	80	38	18	39	9	104	25	16	5	1	7	4 6
Air Surveillance for Hazardous Materials Assessment																2	24	9	5	69	4	12	15	34	234	403
Personnel Protection and Safety	58	12	43	41	154	25	392	41	23	581	52	74	437	40	605	80	44	347	33	507	102	72	432	36	654	2,501
Hazardous Materials Incident Response Operations		44	52	25	157	88	86	95	47	3 6	67	58	1 9	3	38	8	177	194	56	505	140	195	236	60	623	1,981
Total students trained per year					373					.044										65					2.375	933

Key:
EPA = U.S. Environmental Pr
FED = Federal Government
S/L = State and local
IND = Industry
TOT = Total

SOURCE: U.S. nm

Table 5-10.—U.S. Coast Guard Emergency Response Training

Agency and course	Course type[a]	Hours per course	Students per year
U.S. Coast Guard Training Center:[b]			
Port Operations Department	CER	320	70
Marine Safety Petty Officer	CER	240	210
Hazardous Chemical Training	CER	80	210
U.S. ***Coast Guard Headquarters:***[c]			
On-Scene Coordinator/Regional Response Team Exercises	R	12	240
On-Scene Coordinator/Local Response Team Training/Exercises	R	12	750
National Strike Force Training	R	16	960

[a]C - Compliance, E = Enforcement, R = Response
[b]Located in Yorktown, VA.
[c]Located in various locations established by national and regional response team members

SOURCE: U S. Department of Transportation and Federal Emergency Management Agency, ``Report to the Congress Hazardous Materials Training, Planning, and Preparedness,'' unpublished draft. 1986

response training, in the form of l-day workshops at DOE regional locations, to State and local police and firefighters.[62] The Nuclear Regulatory Commission offers, through Oak Ridge Associated Universities, two training courses in health physics twice a year. Since 1960, approximately 500 State employees have been trained in "Health Physics and Radiation Protection." A similar course, "Applied Health Physics," is available for Federal, State, local, and industry personnel.[63] Both courses discuss radiation accidents, the role of a health physicist in medical emergencies, personnel decontamination and protection, environmental monitoring, and environmental sample preparation.[64]

State and Local Emergency Response Training

While more State and local officials are aware of the need for hazardous materials response training, a 1985 survey conducted by the National Response Team (NRT) and the Regional Response Teams (RRT) found that response capability varies greatly from State to State. Many State fire academies have recently added hazardous materials training to their curricula and now offer refresher courses for firefighters and other emergency service personnel.[65] Moreover, organized training programs for personnel involved in oil or hazardous materials emergency response were identified in 27 States. These training programs are generally offered by the State fire marshal's office, the State fire training agency, or the emergency preparedness agency.

In addition to State fire academies, other educational institutions also offer hazardous materials response training for State and local personnel. According to the DOT/FEMA survey, more than 500 educational institutions, including community colleges and universities, offer training in hazardous materials response.[a] These institutions are widely distributed and charge only modest tuition fees; but course content and quality varies from institution to institution.

However, factors limiting State and local participation in training courses were also identified by the NRT/RRT survey; more than 80 percent of States indicated that insufficient funding for courses and for travel was an obstacle. Other problems included the lack of appropriate courses available to State and local responders, and the fact that training is often a relatively low priority for State agency managers.[66]

Moreover, the scope and content of State training programs and emergency response personnel requirements are not consistent. Examples of State training activities, discussed in box SD, illustrate the different types of programs that have been established.

Local training for emergency responders also varies widely, reflecting the relative importance of hazardous materials emergency response in the community or State government and the financial resources available. The spectrum of local hazard-

[62]Theresa Yearwood, Science Applications International Corp., Oak Ridge, TN, personal communication, March 1986.

[63]Jo Tipton, Registrar, Oak Ridge Associated Universities Professional Training Program, Oak Ridge TN, personal communication, April 1986.

[64]Oak Ridge Associated Universities professional Training Programs, course outlines for "Health Physics and Radiation Protection" and "Applied Health Physics," sponsored by the U.S. Nuclear Regulatory Commission, Office of State Programs, unpublished typescript, March 1986.

[65]According to the *Directory of State Fire Service Training Systems*, 24 of the 50 States offer some form of hazardous materials training to firefighters, fire officers, or other emergency personnel. These States are: Arizona, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Indiana, Iowa, Kansas, Maine, Massachusetts, Minnesota, Mississippi, Nebraska, New Mexico, North Carolina, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Vermont, and Washington. National Emergency Training Center, *Directory of State Fire Service Training Systems* (Emmitsburg, MD: National Fire Academy, 1982).

[66]National Response Team/Regional Response Teams, "Federal/State/Local Oil and Hazardous Substances Emergency Preparedness Activities," unpublished typescript, July 1985,

Box 5D.-State Emergency Response Training Program

Ohio

In 1976, Ohio developed a computerized fire reporting system. Analysts studying the results noticed that a significant number of emergency response personnel who responded to hazardous materials accidents were being injured.[1] This spurred the establishment of a hazardous materials training program for firefighters. A three-phase training program began in 1978.

1. Phase I is a 4-hour program that covers identification of hazardous materials, placards, labels, and methods for assessing community problem areas.
2. Phase II is an 8- to 12-hour program that deals with containment, patching, personal protection, hands-on training, and other response procedures.
3. Phase III is a simulation of an actual incident in the community, and includes participants from response organizations, local government agencies, and others that might be involved in an accident.

Since 1980, 36,702 firefighters have been trained through 1,637 courses. In 1982, Ohio assisted the National Fire Protection Association in the development of a similar training program for national distribution to other fire services. Ohio has also made special equipment available throughout the State, because many local fire departments are unable to finance such purchases. Five trucks equipped with approximately $60,000 worth of personal protective equipment have been stationed around the State for dispatch to hazardous materials accidents. Support for training development and equipment purchase was initially provided by two highway safety grants totaling $90,000. Continued support of the training and equipment program is now provided by the State at a cost of $400,000 per year.

California

A uniform standard for the training of hazardous materials response personnel, made final in December 1985, by the California State Fire Marshal's Office is one of the first attempts by a State to develop such standards. The standard identifies two levels of hazardous materials technician training; both positions involve in-depth training and knowledge of hazardous materials. A career development guide has been developed for the first level only. Career development guides, which are the basis of the State certification program, provide minimum performance standards for hazardous materials response; list the State training resources available; and are keyed to the National Fire Protection Association Professional Firefighter Qualifications. In addition to course material covered in the classroom, information specific to a locality is also provided. Entrance examinations are required for those seeking to enter the training program.

Virginia

Virginia has developed four levels of training.

1. Level I training, a 16-hour program, is designed for first responders. It covers an introduction to hazardous materials terms and definitions, identification and nature of hazardous materials, use of the DOT *Emergency Response Guidebook* and other resources such as CHEMTREC, and decontamination.
2. Level II training is based on two 16-hour courses offered by the National Fire Academy—Hazardous Materials Incident Analysis and Hazardous Materials: The Pesticide Challenge. An additional 8-hour segment involves hands-on training.
3. Level III training, a 120-hour program, focuses on the activities of an actual response team. A simulation of a hazardous materials accident is included.
4. Level IV training is still under development, but is expected to focus on incident management and emergency planning.[2]

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[1]Ohio State law requires local fire departments and communities to gather information on and report fires and hazardous materials accidents. Data on the incidence of hazardous materials involvement for fixed facilities and transportation accidents, injuries to personnel, and hazardous materials involved were collected. Don Ryan, Hazardous Materials Bureau, Ohio State Fire Academy, Reynoldsburg, OH, personal communication, Apr. 8, 1986.

[2]Joe Thomas, Virginia Department of Fire Programs, personal communication, May 21, 1986.

Michigan

In Michigan, the Statewide Hazardous Materials Response Plan, inaugurated in 1983, includes provisions for four levels of emergency response training to be given by State certified instructors or State instructors in conjunction with experienced industry personnel.

1. Level I training is encouraged for firefighters, police officers, emergency medical technicians, health departments, and others who may be first responders. Training covers safe approach, material identification, and communication for assistance; it lasts approximately 2 hours.
2. Level II training, a 4- to 6-hour program, is designed for decisionmakers and covers evacuation, spill containment, and incident management, including establishing emergency operations and dealing with the news media.
3. Level III training for specialized hazardous materials response teams provides additional training in protective equipment, transportation equipment valves and closures, containment techniques, and chemical characteristics. At least 16 hours are required to complete this program.
4. Level IV training, approximately 24 hours, is required for industry emergency response teams that might assist or advise local authorities. Training covers capping, patching, and product transfer procedures as well as coordination with local and State responders.[1]

[1][illegible] L. Burnside and Sarah A. [illegible], "Michigan's Hazardous Materials Response Plan," *1984 Hazardous Materials Spills Conference: Prevention, Behavior, Control and Cleanup of Spills and Waste Sites*, Nashville, TN, Apr. 9-12, 1984.

ous materials training courses ranges from well organized and funded hazardous materials offered by highly trained individuals to little or nothing.[67] Moreover, some local officials feel that State programs do not meet the needs of local jurisdictions.

State officials, in conversations with OTA staff, confirmed that standardization of course materials, more coordination between programs, and better information about available courses are necessary for effective training of emergency response personnel. If State instructors are trained at FEMA's National Fire Academy and State programs are based on FEMA courses and materials, greater course uniformity can be expected. Many State training officers contend that the 3- to 6-hour introductory courses offered by many organizations are too superficial to prepare first responders adequately for hazardous materials transportation accidents.[69] In addition, differing criteria are used to certify courses, instructors, and emergency response personnel. Coordination of training agencies, such as fire academies and educational institutions, within each State, is an important step toward providing more comprehensive and uniform training of State and local responders.

An interactive computer system, currently under development for FEMA, will eventually serve as an electronic bulletin board for State and local emergency response personnel, providing information on FEMA training, appropriate hazardous materials literature, State and local contacts, and summaries of properly handled hazardous materials accidents.[70] While comprehensive training information will not initially be available through this system, it is a step in the right direction. Furthermore, the Secretary of Transportation has announced that DOT will establish an information clearinghouse with a toll-free number. The clearinghouse will supply details on training programs, emergency response teams, planning assistance, and other information to help

[67]Association of Bay Area Governments, *National Directory of Hazardous Materials Training Courses* (San Francisco, CA: March 1985), p. 8; and data supplied by the International Association of Fire Chiefs to the Office of Technology Assessment.

[68]This figure is considered too low by industry trainers, due to underreporting and limited industry participation in the survey. Several well-known industry training programs were not included in the survey, U.S. Department of Transportation and Federal Emergency Management Agency, "Report to Congress on Hazardous Materials Training, Planning and Preparedness," unpublished draft typescript, January 1986.

[69]Training officers i, 35 State fire academies, personal communications, June and July 1985.

[70]Users of this system will have access to other materials of interest and will be able to leave messages. FEMA spent $50,000 in 1985 and $60,000 in 1986 for the development of this computer system. Although the system will be available free of charge, necessary hardware, such as a personal computer, must be purchased by participating State or local agencies. William Metz, Argonne National Laboratories, personal communication, Apr. 22, 1986.

local communities.[71] Coordination of these two Federal information-sharing efforts is important to ensure their cost-effectiveness.

Industry-Provided Emergency Response Training

Industry training is provided by individual shippers, manufacturers, and associated trade and professional organizations. Typically, the training covers hazardous materials emergency response for both fixed facilities and transportation accidents through seminars, workshops, and such aids as videotapes and films. However, these training activities are generally limited to larger industries with adequate resources, and current programs reach relatively few local personnel. Moreover, State and local emergency response personnel invited to participate often are restricted to playing themselves in industry training exercises rather than participating in more advanced activities such as unloading a cargo tank. As a result, much of the industry-provided training for emergency response personnel focuses on recognition of hazardous materials, on-scene management, and initial response actions such as spraying foam.

Among the chemical and petrochemical manufacturers that offer hazardous materials training are DuPont, Exxon Chemical, J.T. Baker, Stauffer, Union Carbide, and Mobay.[72] A number of these programs have been opened to neighboring response teams or other interested response personnel. This training varies from l-day seminars to more extensive hazardous materials training and coordination drills.[73]

Recently, five chemical companies established a $400,000 grant to setup a pilot program in New Jersey to train local emergency response personnel for hazardous materials emergencies. Administered by the Union and Middlesex Counties Hazardous Materials Advisory Council (HMAC), the program includes a slide and tape presentation and a 6-hour training seminar.[74] Between February and May 1986, 16 training seminars were held at local fire department facilities. In addition, 200 copies of the slide and tape presentation are being distributed, free of charge, to appropriate emergency response organizations; other copies may be borrowed from HMAC.

The transportation industry also provides emergency response training. Although most of this training was set up originally for shipper and carrier personnel; however, emergency response personnel are invited to participate. Companies that offer training include Flying Tigers and a number of railroad systems, such as Boston & Maine, Burlington Northern, Chessie Systems, Conrail, Soo Line Railroad, Southern Pacific, Southern Railroad Systems, and Union Pacific Systems.[75]

Industry also provides equipment and teaching expertise for training programs offered by other institutions. For example, Shell, Amoco, and ARCO have contributed equipment used in Texas A&M University's annual tank truck rollover response program.[76] Union Pacific Railroad, in cooperation with EPA, offers a training course in emergency response.[77]

Trade associations offering training in hazardous materials and response procedures include the Association of American Railroads, the American Trucking Associations, the Chemical Manufacturers Association, the American Petroleum Institute, the

[71] Elizabeth Hanford Dole, Secretary of Transporation, "Remarks Prepared for Delivery to the Chemical Manufacturers Association," delivered in St. Louis, MO, unpublished typescript, May 7, 1986.

[72] Association of Bay Area Governments, op. cit.; and Hazardous Materials Advisory Council (HMAC), "Survey of Industry Emergency Response Training," *HMAC Courier, vol. 4, No.* 10, Dec. 13, 1985.

[73] For example, Union Carbide training through its HELP program lasts for 1 week, while DuPont Chemical training lasts for 4 days. National Response Team/Regional Response Teams, op. cit.

[74] The five companies participating in the grant program are DuPont, Exxon Chemical, American Cyanamid, Merck & Co., and Union Carbide. Under the pilot program, a slide and tape show was developed for first responders while a l-day seminar was developed for other emergency response personnel. Training materials were produced by the Institute for Life and Safety Technology and Emergency Management of Ashland, MA. Barry D. Bernstein, the Hazardous Materials Advisory Council, Linden, NJ, personal communication by letter, Mar. 27, 1986.

[75] National Response Team/Regional Response Teams, op. cit.

[76] Albert Stirling, Oil and Hazardous Materials Control Divisions, Texas A&M University, College Station, TX, personal communication, Apr. 24, 1986.

[77] Since 1979, Union Pacific Hazardous Materials *Training Activities* have trained 9,383 employees and 36,106 State and local response personnel. In 1984 alone, "Recognizing and Identifying Hazardous Materials," "Defining Your Hazardous Materials Problem," and special training programs reached over 6,000 response personnel. Charles Wright, Training Director, Union Pacific Systems, personal communication, Apr. 29, 1985, and compiled data on Union Pacific hazardous materials training.

National Agricultural Chemical Association, and the Chlorine Institute. Some State associations also sponsor training programs. For example, the Pennsylvania and New Jersey Motor Truck Associations provide training seminars for State Police in their respective States.

To improve the reliability and breadth of information available for hazardous materials response, the Association of American Railroads has developed an emergency action guide for first responders, and a more detailed information system for technical personnel. [78] These systems include information on the 134 commodities that represent 98 percent of railroad hazardous materials traffic.

Professional associations representing emergency service personnel also offer emergency response training. Training includes basic hazardous materials recognition as well as advanced response procedures. These training programs are often more comprehensive and uniform and may be more readily available than training offered by others in the private sector. The National Fire Protection Association, the International Association of Fire Fighters, the International Association of Fire Chiefs, the International Association of Fire Service Instructors, and the International Association of Chiefs of Police are among the professional associations offering such training.[79]

The National Fire Protection Association (NFPA), responsible for the establishment of minimum professional competence standards for firefighters, inspectors, instructors, and officers, has recently begun to develop standards for hazardous materials response. The NFPA standard-setting process, a consensus approach, involves representatives of diverse groups such as the insurance industry; fire, police, and other emergency service organizations; chemical industry representatives; and Federal, State, and local government agencies. Thus, it usually takes 2 or 3 years until NFPA standards are completed.[80]

Conclusions and Policy Options for Emergency Response Training

Approximately 2 million firefighters, police officers, and other emergency service personnel are potential first responders to hazardous materials transportation accidents. Despite an abundance of courses, appropriate training often does not reach these first responders either because the awareness of the need is too low, funding is not available, or uncertainty exists about the appropriate course. Participants in an April 1985 FEMA-sponsored workshop of national, State, and local experts agreed that it is emergency personnel who are most likely to be first responders-that are most in need of training.[81]

Federal expenditures to support emergency response training have placed emphasis on lengthier, advanced level response training courses of the type offered by FEMA at Emmitsburg, Maryland, and EPA at Edison, New Jersey. Such courses are appropriate for personnel that will be part of a hazardous materials emergency response team in an area with an identified high-hazard potential, although these represent a relatively small percentage of the Nation's firefighters.

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[78] The more detailed system, the Industrial Chemical Accident Response Information System (ICARIS), includes four categories of data:

1. *general information:* identification of chemicals including commodity codes (STCC, UN/NA, IMCO), trade names and synonyms, and shipping information.
2. *chemical information:* the chemical properties of the materials.
3. *health and hazard information:* descriptions of health effects, response guidelines, and appropriate protective clothing.
4. *environmental effects information;* compatibility of chemicals, toxicology, and pollution effect data.

ICARIS integrates environmental models with current chemical data to provide real-time assessments of chemical spills and support response decisions by technical staff. ICARIS currently performs three functions: information retrieval, air dispersion modeling, and estimation of chemical properties (e.g., volatility from soil). Gerald A. Meier, Association of American Railroads, "The AAR Chemical Spill Response Information System," unpublished typescript, July 1983.

[79] The National Fire Protection Association provides training to fire and emergency service personnel, primarily through slides, tapes, and instructors guides. National Fire Protection Association, *Fire Service Training Programs, 1985 Catalog* (Quincy, MA: 1985). The National Fire Protection Association also recently developed emergency response training videotapes that can be broadcast via satellite.

In addition, the International Association of Chiefs of Police recently developed a training program on Hazardous Materials Incidents. The Hazardous Materials Incidents training program covers basic requirements for first responders, supervisors, and commanders of hazardous materials incident scenes; on-scene safety precautions; how to establish guidelines for containing hazardous materials; standard development for coordinating multidisciplinary response teams; how to recognize hazardous materials; and how to identify the needs, procedures, and duties of on-scene managers. International Association of Chiefs of Police, *Law Enforcement Training Catalog* (Gaithersburg, MD: 1986), p. 36; and Chuck Peltier, International Association of Chiefs of Police, Gaithersburg, MD, personal communication, Apr. 8, 1986.

[80] Martin F. Henry, Assistant Division Director, Field Services, National Fire Protection Association, Quincy, MA, personal communication, Apr. 15, 1986.

[81] The Federal Emergency Management Agency, National Emergency Training Center, "Proceedings–National Workshop on Hazardous Materials Training," unpublished typescript, October 1985, p. 20.

Photo credit: Research and Special Programs Administration, DOT

Without adequate training, emergency response personnel may enter the accident scene unprotected—a dangerous situation.

OTA concludes that a national strategy to make an appropriate level of hazardous materials response training, whether basic or advanced, available to State and local personnel is urgently needed. The Federal role in developing a training strategy could include: participating in the development of training guidelines, ensuring adequate funding levels, and establishing a training information clearinghouse. While 1.5 million emergency response personnel need additional hazardous materials training, the vast majority require only basic first response training. However, maintaining levels of expertise through refresher courses for those already trained is also important.

Better organization and utilization of existing training resources could increase the numbers trained considerably without additional funds. For example, existing Federal hazardous materials emergency response training and training support programs in FEMA, EPA, the Coast Guard (DOT), NRC, and DOE need to be coordinated and made complementary. However, choosing the right agency to coordinate Federal emergency response programs and administer any special funding program is problematic. Institutionally, that agency is FEMA. The use of FEMA grant monies to support State and local planning and training activities for hazardous materials is limited, however, by the Federal Civil Defense Act, which requires that funds be used primarily for civil defense preparedness. Moreover, while there is widespread agreement about the need for a strong, central Federal leadership role, there is equally widespread doubt about whether FEMA can provide that leadership.

One congressional option is to charge the National Response Team with specific responsibility for coordinating hazardous materials response training and developing national guidelines for courses and levels of training in cooperation with NFPA. Broad-based participation, similar to that in the NFPA process, in developing the guidelines is important. At the Federal level, this would mean that DOT, FEMA, EPA, and probably NRC and DOE would need to reach agreement, a possibility under the auspices of the NRT training committee. This committee has already begun to define both first responder and more specialized target audiences, and identify the tasks and core courses associated with each group. Developing quality control and certification standards for training courses and instructors is also important.

Additional expenditures of $15 to $20 million annually from various public and private sources could support training to large numbers of emergency response personnel. This figure assumes maximum cooperation between Federal, State, and private groups now providing training, and coordinated use of existing training resources including those of industry. Congress might wish to designate a lead agency for developing a direct contract program with the States for funding training. The lead agency could be DOT, EPA, or FEMA, all members of NRT with direct responsibility for training. Funds distributed to States for hazardous materials transportation emergency response training might carry a stipulation that some funds be passed through to local jurisdictions.

The most cost-effective training programs are those that use train-the-trainer techniques. These courses also serve as conduits for programs developed according to nationally accepted guidelines. Congress might consider giving funding priority to States whose training officials participate in Federal hazardous materials training programs, and who subsequently develop State training networks using train-the-trainer courses to improve delivery of training to local emergency response personnel.

In addition, developing a national clearinghouse to make existing information on hazardous materials training available to State and local person" nel, both in hard copy and online, would provide an extremely useful service to emergency response forces. The DOT/FEMA survey provides basic training information already in computerized form. Moreover, the interactive computer bulletin board FEMA is developing and the proposed DOT clearinghouse for response information provide a framework for such a service. Several successful programs exist as models, most notably a DOT-sponsored, microcomputer information exchange administered through a university (see chapter 2).

Financing Emergency Response Training

While the SHMED program and MCSAP have provided basic support for enforcement training, emergency response training urgently needs, but has not received, similar Federal attention. The management of the SHMED program provides a model for a cost-effective Federal emergency response training support program. It made good use of existing resources, provided uniform training, used train-the-trainer techniques, and required that States adopt Federal regulations, designate a State lead agency, and participate in funding.

OTA concludes that an annual Federal funding level of $5 to $7 million, over and above monies now being spent, could provide an adequate Federal assistance program, if existing resources are reorganized and tightly managed. Table 5-11 shows an estimate for a basic hazardous materials training program for first responders. This estimate, based on modular training and a per student cost of $100, assumes that trainees are already trained firefighters, enforcement officers, or medical technicians.[82] OTA believes that this Federal funding level is adequate because considerable resources are already devoted to training, a number of sound courses have already been developed, and the type of training required by first responders is not extensive.

[82]OTA calculations are based on interviews with emergency response trainers and OTA staff experience with four types of emergency response training: industry, jointly sponsored public and private course for community first response personnel, Federal training for public response, and Federal training for Federal response.

Table 5-il.—Calculations for Costs of Hazardous Materials Emergency Response Training for First Responders'

Target audience:	First responders—firefighters, police, hospital emergency room staff, and ambulance drivers.
Size **of target audience:**	1.5 million (approximate)
Nature of training:	Basic training covering identification of hazardous materials, the importance of self protection, protection of the public and environment, and the notification of authorities.
Duration of training:	Modular training geared to appropriate target audiences would be developed and taught by trained instructors. Must provide opportunities for role playing and group problem solving and acquaint response personnel with the unique dangers of hazardous materials response.
Key cost components:	Course development, handout materials/workbooks, instructional services, training personnel, travel, and equipment.
Estimated average cost per trainee:	**$100**[b]
Estimated trainee completions per year:	**150,000 to 225,000**
Required annual fundingtotal:	**$15 to $22.5** million

[a]Thistype of training emphasizes the difference between hazardous materials response and firefighting. Training covers the dangers inherent in hazardous materials accidents, how to identify hazardous commodities, appropriate responsea, and the application and use of protective equipment. Basic training is not designed to cover advanced hazardous materials response techniques or cleanup procedures.

bOTA estimates based on tuition for existing courses and interviews with officials and course instructors. Charges very widely—one large end successful 2-day program is free, whereas another more comprehensive 3-day course charges tuition of $450.

SOURCE: Office of Technology Assessment.

Possible Federal funding sources for emergency response training include:

- general revenue;
- other Federal funding programs related to hazardous materials transportation, such as the Surface Transportation Assistance Act (the fuel tax), the Nuclear Waste Policy Act, or Superfund; and
- creation of a dedicated fund based on user fees, such as those generated by a permit or registration fee levied against hazardous materials industries.

The fuel tax is the most broad-based of these taxes, and gasoline transport accounts for more dollar damages than all other hazardous materials. Since truck accidents require the most frequent emergency response activities, tapping fuel tax funds to support emergency response training provides for a de-

gree of equity. The Nuclear Waste Policy Act provides some funds for State and local activities related to transportation, but such funds are generated by nuclear utilities, and their shipments represent a small percentage of all hazardous materials shipments. Superfund already has substantial claims against it.

Use of funds generated by a Federal registration or permit program could have major adverse impacts on similar State and local activities (see chapter 4). Moreover, the administrative costs for such a Federal program need to be carefully considered. Furthermore, industry will be more willing to support a new user fee to fund training if it obtains assurances that:

- the amounts assessed relate to the magnitude of local training needs,
- the funds reach those most in need,
- a fixed limit is placed on the amount it must contribute,
- local jurisdictions make maximum use of existing regional resources and participate in the funding effort in some way, and
- no individual State or local fee programs are implemented for this purpose in participating jurisdictions.

Two independent groups have supported the concept of a dedicated fund, generated by user fees levied against shippers and carriers to support State and local hazardous materials program development and emergency response training. The groups are the National Hazardous Materials Transportation Advisory Committee, formed by the Secretary of Transportation, and the Hazardous Materials Coalition, formed several years ago by State and local government organizations and some industry representatives. Arguing against this concept are the facts that many jurisdictions already impose registration or permit fees, using them for a variety of purposes frequently unrelated to emergency response, and that requiring payment of another such fee is unacceptable to many industries.[83] Restrictions on their own fee programs, suggested for jurisdictions choosing to benefit from the Federal fund, may be difficult for States to accept.

Equity in apportionment of funds is an important consideration, although an appropriate basis is difficult to determine. Funds could be apportioned to States on the basis of population or of hazardous materials transportation density. However, areas such as the Gulf Coast, California, and the Pennsylvania, Ohio, Indiana, and Illinois corridor, that have the largest amounts of hazardous materials traffic, also have the largest number of industry response teams. Moreover, the need for emergency response training is often not recognized in small urban or rural areas where the probability of an accident is low, but where the consequences of an accidental spill for untrained response personnel could be severe. In addition, jurisdictions that already have well-developed emergency response capabilities have made it clear that they need financial assistance for maintaining training levels and equipment.

Additional local industry involvement in development and delivery of community hazardous materials emergency response training could be encouraged to defray training costs. Support from Federal and private sources for financial assistance to State and local jurisdictions will be more readily forthcoming if jurisdictions can show that they:

- have developed an emergency response plan;
- know what their training needs are;
- have local matching funds or resources available; and
- have cooperated with neighboring jurisdictions in such efforts as joint planning, information collection, and mutual aid agreements.

[83] Two major industry groups, the Association of American Railroads (AAR) and the Chemical Manufacturers Association (CMA) have opposed such a fund in the past. CMA is modifying its opposition, requesting further study to quantify the need; AAR remains opposed.