Chapter 3

Emergency Response and Training

Chapter 3

Emergency Response and Training

State and local governments must be able to respond effectively to hazardous materials transportation emergencies as part of their obligation to protect the health and safety of the public. Local police officers are usually first at the scene of an accident and have primary responsibility for public safety. Their skill in handling the accident determines in part the impact that accident will have on those in the immediate vicinity and on the community at large.

Two responses to hazardous materials transportation accidents occurring 3 years apart illustrate the range of problems associated with hazardous materials emergency response activities and the improvements developed with time and experience in response procedures.

On October 15, 1982, an accident in Odessa, Delaware, between a pickup truck and a tank truck resulted in a rollover of the tank truck and the release of about 150 gallons of the product from the tank truck's dome cover. The tank truck contained divinyl benzene (DVB), a moderately toxic material when inhaled, and carried a "combustible" placard.

Arriving police officers reviewed the shipping papers, moving freely about the accident site. Approximately 100 emergency response personnel eventually responded to the accident; only some had previous experience or training in handling a hazardous materials transportation accident.

Photo **credit: Research** *and Special Programs Administration, DOT*

Unprotected emergency response personnel in action—a dangerous situation.

One hour after the crash, 48 emergency response personnel, complaining of respiratory and skin problems, were taken to the hospital, as was the tank truck driver who was still carrying the shipping manifest and bill of lading.

Emergency responders who remembered the name of the product consulted the U.S. Department of Transportation (DOT) *Hazardous Materials Emergency Response Guidebook* to identify the material. DVB is not listed by name in the guidebook, so they followed the instructions for divinyl ether, the only "divinyl" entry.[1] Although trained safety personnel from the tank truck company involved in the accident had arrived to clean up, they were not allowed to participate for almost 12 hours.[2] Problems associated with this hazardous materials accident included lack of coordination among responding organizations, inadequate information provided to hospital personnel treating emergency responders, failure to establish and maintain control over the accident site, and the participation of untrained individuals in response activities.

In contrast, on August 12, 1985, a tank truck carrying hazardous waste from the Norfolk, Virginia, Naval shipyard to New Jersey began to leak and stopped on the Capital Beltway in Northern Virginia during the evening rush hour. The waste consisted of hydrazine, thiourea, ethylene diamine, ethylene diamine tetraacetic acid, ammonium hydroxide, and sulfate compounds, which had been used to clean ships and submarines at the shipyard.

The Fairfax County, Virginia, Fire Department Hazardous Materials Team was on the scene within 10 minutes of notification. Concerned that the contents of the truck would corrode the container and cause it to burst, team members attempted unsuc-

---

[1]C. H. Batten, Investigator, National Transportation Safety Board Accident Investigation Report, Oct. 15, 1982; and National Transportation Safety Board Safety Recommendations, I-83- 1 and 1-83-2, issued Nov. 29, 1983.

[2]Gene Meehnan, Safety Director, Matlack Co., personal communication to OTA staff, Mav 28, 1985.

cessfully to stem the leak and then requested another vehicle to off-load the truck. Authorities, recognizing the danger posed by corrosive fumes, ordered the evacuation of residents in the area just south of the accident scene. Railroad tracks near the site were shut down, and traffic in the area was rerouted around the scene of the accident. No one was injured, although hundreds were inconvenienced for several hours.

Cleanup of the contaminated site involved digging up and disposing of 18 inches of asphalt and soil and an estimated 21 tons of sand spread to restrict the flow of spilled material. Some of the cleanup costs reportedly will be paid by the shipping company.[34] Fairfax County costs for overtime pay for personnel from 10 county agencies and use of a helicopter may reach $100,000.

The contrast between the responses to the two incidents is marked, and demonstrates the difference coordination, cooperation, and training can make in ensuring an appropriate response. The Fairfax County hazardous materials incident involved the coordinated efforts of 10 county agencies to successfully handle a potentially dangerous incident. By comparison, the dangers inherent in the Odessa DVB spill were increased by the varying levels of training and coordination of the emergency response personnel, and much greater risks were posed to participating emergency service personnel and neighboring communities.

Without appropriate organization, training, and equipment for emergency response personnel, the public is at greater risk than necessary as hazardous materials move around the country.

This chapter explores emergency response from a State and local perspective. A literature review, findings of an OTA workshop with State and local officials, supplementary interviews, and surveys recently commissioned by the Federal Government and professional associations provide the basis for the information. Four topics are addressed:

- the institutional and legal framework for emergency response;
- training requirements and programs;
- planning for emergency response, including identification of problems and organization of resources; and
- equipment.

'Mary Jordon and Martin Weil, "Chemical Spill Snarls Beltway," *Washington Post*, Aug. 13, 1985.

[4]*Chemical & Engineering News*, "Rash of Chemical Spills Occurs on Single Day," vol. 63, No. 33, Aug. 19, 1985, p. 6.

INSTITUTIONAL FRAMEWORK

Federal Responsibilities

Federal assistance for State and local emergency response activities for hazardous materials accidents is provided by many different Federal agencies.

The Federal Emergency Management Agency (FEMA) is the lead agency for the development and coordination of Federal emergency response plans to support State and local emergency response activities and to provide appropriate training. In this role, FEMA provides planning support and guidance prior to hazardous materials accidents and coordinates Federal response after the fact.

The U.S. Environmental Protection Agency (EPA) and the U.S. Coast Guard share responsibility for providing technical information and advice to first responders and State and local governments. If State and local governments cannot handle a severe accident or request Federal intervention, EPA and the Coast Guard will assume control and direct Federal emergency response activities. The Coast Guard operates the National Response Center for DOT as the point of contact for transportation accidents involving hazardous materials. In addition, the Coast Guard operates and maintains strike forces on the Atlantic, Pacific, and Gulf coasts for emergency response activities.

In the case of radiological accidents, Federal responsibility is shared by FEMA, the Nuclear Regulatory Commission, and the U.S. Department of Energy. NRC and DOE maintain authority for planning and program development for emergency response, notification, technical assistance and advice, and involvement in response activities for radiolog-

ical spills. In addition, DOE maintains 30 regional emergency response teams for radiological incidents.

All of these Federal agencies conduct emergency response training, although the subject matter may differ. FEMA provides training in emergency response procedures at regional centers and at the national center, the National Fire Academy in Emmitsburg, Maryland. Training covers basic and advanced hazardous materials management classes.

EPA training is offered at two regional sites, Edison, New Jersey, and Cincinnati, Ohio, as well as nationally. Training covers response operations, equipment, and response decisionmaking. The U.S. Coast Guard offers training in basic hazardous materials emergency response to its employees and State, local, and industry participants at Yorktown, Virginia.

NRC training, offered at the Technical Training Center in Chattanooga, Tennessee, focuses on inspection and enforcement rather than on emergency response. Training previously conducted by DOE for Federal contractors and employees has been expanded to allow commercial carriers; enforcement agencies; and State, county, and local police and fire officers to participate. Courses cover basic emergency response and compliance with transportation regulations.

Federal emergency response activities are intended as supplements to, not as substitutes for, State and local emergency response to hazardous materials transportation accidents. Federal agencies generally offer technical advice and information, rather than physical assistance. However, active Federal participation is likely if radioactive hazardous materials, particularly spent fuel, is involved in a transportation incident.

Table 3-1 identifies the different Federal agencies that regulate hazardous materials transportation and their jurisdictional authority. This diversified Federal authority is a major reason that developing effective, coordinated Federal emergency response capabilities has proven difficult.

State and Local Authority

State authority for hazardous materials transportation and emergency response is equally fragmented and 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. A State-by-State listing of the agencies responsible for hazardous materials regulation, enforcement, and emergency response is provided in appendix A.

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 incident are more likely to support and encourage the development of emergency response planning and training and attempt statewide coordination. Believing that State assistance may be the best or even the only way of protecting rural areas in hazardous materials accidents, some States, including North Dakota, Delaware, Indiana, and Oregon, are developing statewide emergency response plans.

Tennessee has undertaken a unique program to improve its statewide emergency response capability. 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. * In addition, the district coordinators are covered by State liability laws and thus can provide assistance in other districts without fear of lawsuits.

Communities of all sizes are becoming more aware of the dangers associated with hazardous commodity transportation and are looking for ways to lower their risks. The same factors that influence State emergency response development also operate at the local level, with communities that have experienced

*George Kramer, Hazardous Materials Instructor, Tennessee Emergency Management Administration, personal communication to OTA staff, Nov. 26, 1985.

Table 3-1.— Jurisdictional Analysis of Agency Responsibility

	Premarket testing	Manufacture	Handling	Storage	Use	Labeling	Package/container design	Packaging/placarding	Shipping papers	Transportation equipment	Inspections—process/storage	Inspections—transportation	Notification	Response/containment	Cleanup, mitigation, disposal	Accident reporting requirement
Federal:																
Federal Highway Administration (U.S. Department of Transportation)						X	X	X	X	X		0	0			X
Federal Railroad Administration (U.S. Department of Transportation)			X			X	X	X	X	X		X	0	0	0	X
U.S. Coast Guard			X			X	X	X	X	X	X	X	X	X	X	X
Federal Aviation Administration (U.S. Department of Transportation)			X			X	X	X	X	X	X	X	X	0	0	X
Office of Pipeline Safety (US. Department of Transportation)			X				X			X	X	X	X	0	0	X
National Transportation Safety Board (U.S. Department of Transportation)													X			X
Environmental Protection Agency	X	X		X	X	X		X	X		X		X	X	X	X
Federal Emergency Management Agency													X	0		X
Department of Health and Human Services		X	X		X								X			
Nuclear Regulatory Commission		X	X	X	X								X*	O*	X*	X"
Bureau of Alcohol, Tobacco and Firearms (U.S. Treasury)				X	X								X			
Department of Defense, Explosives Safety Board			X	X	X								X*	O*	X*	
Department of the Army														0*		
State:																
Department of Emergency Services													X	X	O	
Labor and Industry		O	0	0	O						O					
Department of Social and Health Services		0	0	0	0						O		X*	O*	O	X
Department of Agriculture			X*	X*	X*						O		X*			
Department of Ecology		X											0	0	X	
Washington Utilities and Transportation Commission								X	X	X		X				X
Washington State Patrol								X	X	X		X	X	X	O	X
Local:																
City fire		O	X	X	X	0					X		X	X	O	
City building department		X			X											
City police										X						
County fire				0	0						O		X	X	O	
County police										X						
City/county Department of Emergency Services													0	0		
City/county health department														X		

"Denotes that scope of authority will depend on type of substance, location of spill, or identity of carrier or discharger,
X—Denotes major authority in the **area** of regulatory administration of enforcement.
O—Denotes limited authority in the area of regulatory administration of enforcement,

SOURCE: Hazardous Materials Demonstration Project Report-Puget Sound Region.

serious hazardous materials accidents or have large chemical plants more likely to be concerned about developing emergency response capabilities.

Communities with emergency response capabilities have set up various response systems. In rural communities, hazardous materials emergency response usually is an additional duty assigned to the fire or police department. Large metropolitan areas are more likely to train and equip specialized units. Large cities and urban areas with major transportation corridors or heavy concentrations of business and industry requiring hazardous materials may use response teams supplemented with formal mutual aid agreements with nearby jurisdictions. In fact, the emergency response capabilities in a few suburban communities may surpass the capabilities of State emergency response organizations, through the organization of mutual aid networks, consolidation of resources, and widespread community support.

However, local governments often find it difficult to justify the cost of specialized equipment, training, and manpower for events that occur rarely. 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 restraints. 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 often beyond local capabilities. Industry resources would be especially valuable in the event of an accident involving complex combinations of chemicals or unusual circumstances.

One example of a regional emergency response team augmented by public and private sector cooperation is the Gateway Response Network, organized by area governments, public services, and business and industry in the greater St. Louis region. Under the auspices of the the East-West Gateway Coordinating Council, a regional organization, the Network was formed specifically for response to hazardous materials transportation accidents. Network activities have included identifying the hazardous materials stored and transported through the region; identifying existing local and industry emergency response teams; developing a coordinated response to hazardous materials transportation accidents; and providing equipment, including a special van. The Spokane, Washington, Fire Department has a similar arrangement with the rest of Spokane County and Northern Idaho.

Industry Response

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 known effort is the Chemical Transportation Emergency Center (CHEMTREC), established in 1970 by the Chemical Manufacturers Association (CMA), CHEMTREC maintains an on-line database on the chemical, physical, and toxicological properties and health effects of the thousands of products of the member companies.

Personnel at the scene of an accident call CHEMTREC with information on the accident and the material involved. CHEMTREC staff provide chemical information for use in onsite decisionmaking and notify the manufacturer of an accident involving their 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. CHEMNET is used to identify members of CMA with particular chemical expertise to assist in emergency response efforts.

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 are instructed to defer to the local on-scene commander at an accident so that the emergency response effort remains coordinated.[5]

[5]E.E. Eigenschenk, Mid-continent Distribution Manager, Shell Oil Co., personal communication with OTA staff, June 4, 1985. The American Petroleum Institute recommends that a particular procedure, known as practice 111.2, be part of emergency response plans.

The Channel industries, the Pesticide Safety Team Network, and Chlorep are other examples of emergency response capabilities provided by industry. The Channel industries in Houston have extensive mutual aid agreements with each other. By pooling resources, this concentration of chemical industries along the Texas Channel can assemble 500 firemen and other trained personnel, some 60 water pumpers, 45 chemical retardant fire trucks, and 12 truck-mounted powerplants.

The Pesticide Safety Team Network (PSTN) and Chlorep, specialized information and emergency response units, were formed by manufacturers to respond to accidents involving pesticides and chlorine. PSTN, a voluntary effort established in 1970, consists of 50 to 60 response teams. When a pesticide accident occurs, someone at the site notifies CHEMTREC, which in turn notifies one of 10 PSTN regional coordinators. The coordinator then contacts personnel at the accident site to determine what response is needed. If telephone advice is not sufficient, the manufacturer is notified and responds accordingly. Approximately 90 percent of pesticide manufacturers respond to accidents involving their product.[6] If a manufacturer is unable to respond, the closest safety team will be dispatched to respond to the incident and handle cleanup. Cleanup costs are absorbed by the participating team.

Chlorep, a response network of chlorine manufacturers and packagers, responds to emergencies involving chlorine products. Founded in 1972 by the Chlorine Institute, Chlorep currently includes 37 manufacturing and 31 packaging companies among their response network members.

With its specialized resources, detailed knowledge of hazardous materials, and extensive product information, industry can provide a logical adjunct to public safety capabilities for fixed facility and hazardous materials transportation emergency response.

[6]Lawrence Norton, National Agricultural Chemical Association, personal communication with OTA staff, Aug. 30, 1985.

TRAINING

Widespread and improved emergency response training at the State and local levels using uniform standards is the major need identified in-all DOT demonstration projects, in OTA's research, and by congressional concern.

The effectiveness of current training programs is uneven because:

- a wide range of response personnel need training, and only some currently receive it;
- numerous separate organizations offer differing courses; and
- the content and quality of training courses is diverse.

Existing Training Programs

Under the 1984 Hazardous Materials Transportation Act reauthorization, Congress required DOT and FEMA to survey training programs offered for hazardous materials emergency response and enforcement activities. Final-results of these surveys are anticipated in January 1986. To date, some 700 agencies, public and private, have been identified as offering some form of hazardous materials training or planning. Of these, 574 offer training in planning and response; 297 provide training in enforcement and compliance. T However, public expenditures for training are directed primarily at compliance and enforcement activities rather than at emergency response. (The OTA final report, *Transportation of Hazardous Materials,* will provide further details.)

At the Federal level, a myriad of training programs related to different aspects of hazardous materials emergency response are conducted by FEMA, DOT, EPA, DOE, NRC, the Department of Defense (DOD), and the National Institute for Occupational Safety and Health (NIOSH), at both national and regional locations. Although representatives of many of these agencies meet regularly as members of the National Response Team, a single, strong Federal strategic approach to emergency response training has not been achieved.

[7]Douglas Stancell, Transportation Programs, Science Applications international Corp., Oak Ridge, TN, draft study, Department of Transportation/Federal Emergency Management Agency.

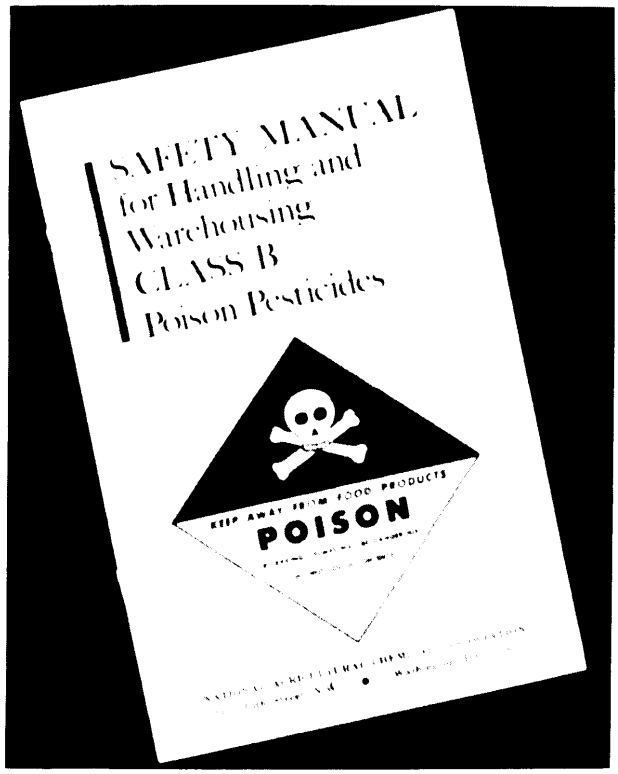

Photo credit: Research and Special Programs Administration, DOT

Many industry resources are available to assist emergency response personnel.

There are few formal training programs for emergency responders at the local level and those that do exist may involve courses at a neighboring community college or informal in-house training.

Industry training, offered by individual shippers, manufacturers, and associated professional organizations, typically covers hazardous materials emergency response for both fixed facilities and transportation accidents. While intended primarily for company employees, these courses may include provisions for training local public response personnel. For example, major companies may donate equipment and invite local first responders to observe their training sessions; Shell Oil and Amoco are among the companies that have such programs. Training offered by national professional and industry associations includes programs by the National Fire Protection Association, the American Petroleum Institute, the National Agricultural Chemical Association, and the Chemical Manufacturers Association. State associations may also have training programs. For example, the Pennsylvania Motor Truck Association provides training for every Pennsylvania State patrolman.

For example, training courses offered by executive branch regulatory agencies, such as DOT and NRC, concentrate on enforcement aspects of hazardous materials transportation regulations. Agencies such as DOE, EPA, and NIOSH offer training in the aspects of hazardous materials directly related to their own areas of responsibility.

FEMA, the lead agency for Federal emergency management, offers specific hazardous materials emergency response training programs at the National Fire Academy in Emmitsburg, Maryland; at FEMA regional headquarters; and around the Nation through its "Train the Trainer" courses.

Hazardous materials emergency response training programs offered at the State level are generally the responsibility of the State fire marshal's office, the State fire training agency, or the major emergency preparedness agency. The courses differ from State to State, although if the State trainers have been trained by FEMA, greater course uniformity can be expected.

m ry g

g

g

Training that covers rail hazardous materials emergencies is usually offered by railroad companies to employees, shippers, and invited local emergency responders. Emergency response training for highway hazardous materials accidents is offered by shippers and carriers as well as State and local governments.

OTA tallied results of a survey conducted by the International Association of Fire Chiefs in June 1985 on hazardous materials team response capabilities across the Nation. Table 3-2 shows the training sources most frequently used by State and local emergency responders.

No systematic way exists to ensure that existing emergency response training courses reach those who need the training. In telephone interviews with OTA staff, State training officers voiced frustration at the lack of information they receive on the quality of available training resources and the lack of communication with their counterparts in other States. Moreover, some local officials are concerned that planned State programs are inadequate to meet the needs of local jurisdictions. A national network of hazardous materials emergency response trainers and a national clearinghouse for training information are two relatively low-cost means of addressing these concerns.

Training Needs

The population needing hazardous materials response training is numerous and diverse. Local fire or police department personnel are usually the first to respond to a hazardous materials transportation accident, and their training is of primary importance. However, personnel from other groups often participate in response activities and require training as well.

Table 3-2.–Frequently Used Training Sources, 1985

Training course	Number of State and local hazardous materials team attendees
National Fire Academy.	79
Industry (unspecified)	68
State training programs.	65
Colleges or universities	59
Safety Systems, Inc.	53
Texas A&M ., ...	25
In-house training	21
Colorado Training Institute ...	18
Radiological Monitoring	18
National Fire Protection Association	17
EPA . . .,	17
U.S. Coast Guard . . .	13
Union Pacific/EPA Region Vll	7
Other	33

SOURCE: International Association of Fire Chiefs survey, June 1985; and the Office of Technology Assessment.

The National Fire Academy reports there are approximately 1,200,000 firefighters nationwide, 85 percent of whom are volunteers, and the remaining 15 percent paid employees of municipal, county, or local governments.[8] According to the National Association of Chiefs of Police, there are between 480,000 and 500,000 local sheriffs and police personnel employed by State and local governments.[9]

Civil defense volunteers and health professionals also may respond to hazardous materials transportation accidents. Approximately 223,600 emergency medical technicians are registered nationally.[10] These individuals need some training in assisting victims of hazardous materials accidents.

State and local government officials and emergency service agencies say that it is the inappropriate responses of untrained or poorly trained first responders of a predominantly volunteer force that are most likely to harm the first responders themselves and the surrounding community. According to reports of professional associations involved with emergency services, many first responders do not have access to training. In addition, the 25 percent annual turnover rate within fire departments increases the difficulty of maintaining a trained emergency response force.[11]

Coordinated efforts to train potential first responders in rural and small urban areas are necessary, The training should emphasize the differences between hazardous materials response and firefighting. While firefighters rush to the scene, hazardous materials responders must identify the product and the potential damage, and the appropriate response, before approaching the accident. Training in the

[8]Ray Donovan, National Fire Academy, Federal Emergency Management Agency, Emmittsburg, MD, personal communication with OTA staff, 1985.

[9]Gerald Arenberg, Executive Director, National Association of Chiefs of Police, personal communication with OTA staff, 1985.

[10]National Registry of Emergency Medical Technicians, *Registry: The Newsletter of the National Registry of Emergency Medical Technicians, vol. 17, No. 1,* winter 1985, p. 7.

[11]Chief Warren Isman, Fairfax County Fire Department, Fairfax County, VA, personal communication with OTA staff, 1985.

application and use of protective equipment is also important.

In addition, police departments and emergency medical personnel, as well as public health departments, public works departments, and environmental health departments need to know how to handle hazardous materials emergencies. Hazardous materials training, protective equipment, and decontamination procedures should be added to training for ambulance drivers, hospital personnel, emergency room physicians, nurses, and orderlies. As part of a DOT demonstration project, Memphis organized a full-scale accident simulation to evaluate emergency medical capabilities. It became apparent that emergency medical services and hospital personnel were not familiar with treatment of chemical injuries or the need for decontamination after chemical exposure. It is likely that many hospitals and hospital emergency rooms suffer from this same lack of knowledge.

Training Content and Quality

Defining the needs of first responders and examining how these needs are being met has not yet been systematically undertaken. Development of a uniform comprehensive training program for emergency response activities hinges on unified national or Federal attention, rather than on piecemeal efforts at the State or local level.

State and local officials have suggested that a systematic approach to training first responders should include: 12

- a curriculum based on a clearly defined job analysis that identifies what personnel should know regarding hazardous materials management;
- cross-training for each of the groups needing training (fire, police, industry, Federal, and State personnel) in the vital areas of response enforcement and compliance;
- well-qualified and expert hazardous materials trainers; and
- a clearinghouse or coordinator for hazardous materials training to identify useful training courses for particular needs.

The identification of available training programs, such as the surveys undertaken by DOT and FEMA, is a preliminary step in the development of a comprehensive emergency response training program. Interim survey results document a spectrum of training programs offered by Federal, State, and local agencies; private companies; and industry.

Training for emergency response to hazardous materials incidents must cover the regulatory requirements of hazardous materials transportation, including proper substance identification, shipping papers, placarding, and emergency notification procedures. Training in these requirements is offered by DOT, DOE, DOD, and NRC.

Most DOT training programs stress enforcement of regulations, including placarding recognition and use of the DOT Emergency Guidebook, rather than direct emergency response procedures. The U.S. Coast Guard offers classes in hazardous materials regulatory compliance to shippers and carriers, and emergency response training to Coast Guard personnel and other emergency responders for water-related hazardous materials transportation problems.

EPA offers training on hazardous materials emergency response at regional headquarters. The training focuses on hazardous materials chemical and physical properties, advanced emergency response techniques, and cleanup activities.

In the past, FEMA training programs focused primarily on training for emergency response to radiological accidents; new emphasis is now being placed on emergency response to hazardous materials accidents. A six-part monthly teleconference series sponsored by FEMA and the National Fire Academy, being held between September 1985 and March 1986, covers a variety of emergency response issues, including planning for and responding to hazardous materials emergencies.

State officials, in conversations with OTA staff, indicated that the basic first responder training courses offered by most States include recognition and identification of hazardous materials. Many State training officers contend, however, that existing first responder training courses are too superficial to prepare first responders adequately for hazardous materials transportation accidents.[13] They urge

———.

[1] 'U.S. Congress, Office of Technology Assessment, "Transcript of Proceedings—OTA Workshop on State and Local Activities in Transportation of Hazardous Materials, " Washington, DC, May 30, 1985.

[13] Personal communication of OTA staff with training officials in 35 State fire academies, June 25-July 20, 1985.

the establishment of national guidelines for different levels of emergency response training, for training course content, and personnel requirements.

Local training for emergency responders varies widely, reflecting the importance placed on hazardous materials emergency response by the State government and the financial resources available. The spectrum of local hazardous materials training courses ranges from well organized and funded hazardous materials courses offered by highly trained individuals to little or nothing.[14,15]

Because of the large volumes transported, petroleum products are the most likely hazardous materials to be involved in accidents. Most first responders already have extensive experience in dealing with petroleum product accidents, regarding them as an extension of firefighting duties. Therefore, State and local training programs may need to concentrate on those hazardous materials first responders have not previously encountered, particularly corrosives and other commodities. An inappropriate response to an accident involving unfamiliar chemical products could endanger individuals, the entire team, or the surrounding community.

One example of a public-private agency cooperative training program is that between EPA and the Union Pacific Railroad in EPA Region VII. A 2-day training course in hazard identification and approach is offered free of charge to multidisciplinary groups with emergency response duties. The course emphasizes that emergency response to hazardous materials incidents is unlike routine fire suppression in several ways; for example, response personnel must identify the types of hazards facing them before approaching the accident or attempting rescue missions.[16] The course is offered throughout Region VII to maximize involvement by first responders. Although other EPA regions have expressed interest in the course, this program is unique to Region VII.

Other successful training courses around the country concentrate on training individuals, organizing the individuals into teams, staging simulation hazardous materials accidents, and involving other agencies in simulated emergency response. These simulations provide an opportunity to test emergency response plans and discover organizational problems prior to an actual hazardous materials accident.

Recent innovations in the presentation of emergency response training include the National Fire Protection Association's television broadcasts of emergency response training and the six FEMA teleconferences. Such programs, available free to appropriate groups across the country, can deliver training at low cost to large numbers of first responders wherever television satellite reception can be arranged. *

Another innovative emergency personnel training program is offered through the National Highway Traffic Safety Administration. If requested under the State and Community Highway Safety Grant Program, receipt of Federal highway funds is linked to meeting emergency medical service training requirements. A similar program could be instituted for hazardous materials first responder training.[17]

[14] Association of Bay Area Governments (ABAG), *National Directory of Hazardous Materials Training Courses* (San Francisco, CA: March 1985), p. 8.

[15] Data supplied by the International Association of Fire Chiefs to OTA.

[16] Charles Wright, lecture at Hazardous Materials First Responder Course presented by Union Pacific Railroad and U.S. Environmental Protection Agency Region VII.

*For further information call Mary Ellis at FEMA at (202) 64 6-2692.

[17] Hal Butz, Department of Transportation, National Highway Traffic Safety Administration, Enforcement and Emergency Response Division, personal communication with OTA staff, June 25, 1985.

PLANNING AND ORGANIZING FOR EMERGENCY RESPONSE

Emergency response plans, if properly implemented, can organize and coordinate the response activities of a variety of agencies. Communities concerned about hazardous materials transportation accidents are developing hazardous materials emergency response plans that utilize community resources.

Although hazardous materials truck movements probably dominate State and local planning and training, well-prepared State and local emergency response plans will address hazardous materials transportation by all relevant transport modes. According to 1983 rail waybill statistics, railroad

shipments of hazardous materials, bulk shipments of petroleum products, chemicals, pesticides and herbicides, and occasionally spent fuel elements, reached 73.1 million tons, or 5.4 percent of all rail tonnage.[18] Barge movements of hazardous materials include bulk loads of petroleum and petroleum products, coals, and chemicals and chemical products. In 1981 to 1982, 66 percent of total water freight movements were hazardous materials.[19] Airborne shipments, the smallest percentage of hazardous materials movements, are generally radioisotopes, valuable commodities, and sensitive materials requiring rapid delivery.

Radioactive materials constitute only a small percentage of hazardous materials; in the past they have been the focus of many federally funded State emergency response planning programs. DOT statistics show, however, that the transportation of gasoline, fuel oil, and other petroleum products is far more likely to cause damage to public property and the environment than radioactive materials. This suggests that hazardous materials planning activities should encompass these familiar materials.

Planning for emergency response is recognized by State and local governments as indispensable in developing more coordinated and effective response activities. As identified by State and local governments, the primary areas needing attention during planning include:

- improved coordination among Federal, State, and local agencies at every level;
- coordination with industry response programs;
- advance agreement about who is in charge;
- adequate communication between the accident site and off-site command posts;
- other operational concerns; and
- public information.

Coordination

Development of better coordination among Federal and State emergency response agencies would ease many planning-related problems facing State and local emergency responders. Issues needing a coordinated approach include: funding for emergency response training and planning; information dissemination on appropriate hazardous materials emergency response procedures; and a clear delineation of Federal, State, and local hazardous materials emergency response capabilities and responsibilities.

At the State, regional, or local level, plans that outline specific responsibilities, coordinate on-site activities, and appoint a response leader can reduce the confusion at the accident site and provide a clear chain of authority for response activities. Fire, police, and other organizations that may participate in emergency response should be part of the planning process to establish the lead agency in emergency response situations. Any governmental mutual aid agreement should determine the on-scene coordinator in advance.

Industry has contributed to many local emergency response activities, but questions remain regarding emergency response on private property, such as a company facility or a railroad right-of-way. Advance arrangements between special industry response teams and existing public emergency response networks as to these issues will enhance response efforts. Formal mutual aid agreements between independent industry response teams and communities are a means of achieving coordinated and comprehensive response capabilities at reduced expense. They allow neighboring communities to share equipment, fire and police department manpower, emergency medical services, and private sector resources. A recent effort, the CMA's Community Awareness and Emergency Response Program, encourages industry to cooperate in the development of community emergency response plans.

Operational Concerns

Communication and liability issues should also be covered during the planning process. Communication is vital in any emergency and involves both hardware and organization. At the planning stage, participating response agencies should identify equipment requirements and procedures to ensure adequate communication, both on and off site, equipment compatibility, and isolation of frequencies for emergency use.

[18] Mark Abkowitz and George List, "Hazardous Materials Transportation: Commodity Flow and Incident/Accident Information Systems," OTA contractor report, October 1985.

[19] The American Waterways Operators, Inc., *American Waterway Operators Annual Report: 1981-1982* (Arlington, VA: 1983).

In addition, some currently available resources do not correspond to the needs of State and local responders. Additional information on the degree of hazard for hazardous commodities, especially identification of the chemicals most dangerous to first responders and the community at large, would enable planners and responders to assess risks more readily. Hazardous commodities are immediately identifiable to emergency responders if correctly placarded as radioactive materials, poisons, etiologic agents, flammables, combustibles, oxidizers, corrosives, caustics, explosives, and pyrophoric materials. Within these categories, some substances are much more dangerous than others. Additional indication of the relative degree of hazard has been of concern to State and local government officials and emergency responders since 1970. Adoption of the United Nations numbering system, a classification and identification system developed for international commerce, does not address the problems the current system poses to hazardous materials emergency responders, although it provides a uniform numerical identification when it is used.

One example of the need for gradations of hazard is the categorization of methyl isocyanate (MIC), responsible for more than 2,000 deaths and thousands of injuries to residents of Bhopal, India. For years, MIC has been classified only as a flammable material by the Department of Transportation. Only recently has DOT changed its designation and placarding and handling requirements to indicate the dangers of inhalation.[20]

The DOT *Guidebook,* the most widely available response information resource, may provide incomplete information about a substance, as it did in the Odessa, Delaware, spill. Moreover, the components of hazardous waste, a combination of materials that form a volatile mixture or pose multiple hazards, are not fully identified.

The high violation rate found among hazardous materials transporters of placarding, shipping papers, and marking regulations also concerns emergency response personnel. First responders must often assess the risks of the hazardous materials and make decisions on response procedures based on incorrect or incomplete information, potentially endangering themselves and neighboring commumties.

Another growing concern of hazardous materials teams and local governments is disposal of hazardous materials and contaminated soil, etc., following cleanup. An emergency response team left in possession of removed materials becomes a generator, storer, and transporter of hazardous waste subject to Federal hazardous waste requirements.

Liability issues are a concern for governmental entities, which may be held responsible for emergency response activities that result in damages. Carefully crafted Good Samaritan laws can relieve the burden of potential liability for qualified emergency responders who assist during a hazardous materials transportation accident. Industry liability after response to hazardous materials accidents remains a major industry concern.

Public Information

Providing accurate reports to the press and public is another necessary part of coordinated emergency response activities. At many accidents, particularly severe ones, the media becomes a part of the response process and is an important public information resource. Although most communities recognize the importance of public information in the emergency response process, media representatives are not typically included on planning task forces.

A training course for press personnel on dealing with bad news* stresses the need for careful advance planning and a clear strategy for providing an accurate information flow to the media and to the public. Emergency response plans should include designating spokespersons skilled in giving print and electronic media interviews. The first media contact can determine how the incident is perceived by the public and can help maintain public calm and cooperation.

---

20 Washington Post, "Chemical Shipping Rule Issued," Oct. 10, 1985.

*For example, Lehigh University Journalism Department and Office of Continuing Education in Pittsburgh, PA, offers a training course in press management of emergency situations.

PROTECTIVE EQUIPMENT

Emergency 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.[21]

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. 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 cost of protective suits ranges from less than $100 for a disposable Tyvek 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. In combination, these types of equipment, used properly, produce a high level of protection for emergency responders. However, the cost of such equipment is far beyond the budgets of many small communities.

Moreover, no existing protective clothing is resistant to all classes of hazardous materials. Thus, the selection of chemical protective equipment requires assembling equipment components—gloves, headgear, coveralls—that offer similar ranges of chemical protection. Firefighters and hazardous materials response teams currently rely on fire service literature, manufacturer information, and accumulated personal expertise when selecting chemical protective gear. Firefighter gear is only now being tested for chemical resistance, however. To provide effective protection, equipment must fit properly, be used correctly, and be maintained appropriately. 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 respiratory protective equipment.

Em g m m m w
m g g

The development of equipment standards, purchase recommendations, and equipment training programs by a national body, either the Federal Government or professional associations, would provide local emergency responders with a body of knowledge from which to make accurate and informed decisions.

[21] IA. D. Little Co., "Protective Clothing and Equipment," *Chemical Hazmat Response In formation System (CHRIS) Response Methods Handbook* (Washington, DC: U.S. Coast Guard/ 1-1. S. Department of Transportation, December 197 S), p. 7-1.

FINDINGS

- **Additional training for public safety personnel in hazardous materials emergency response is urgently needed. No** comprehensive framework for emergency response training activities exists today at the Federal, State, or local level, resulting in insufficient attention to and funding for training activities.
- **Movements of gasoline and petroleum products (which constitute 50 percent of the hazardous materials transported) account for more hazardous materials transportation accidents, injuries, and damages than other classified commodities.** Most emergency response personnel are adequately trained to fight petroleum fires. Nonetheless, given the magnitude of the problem, planners, enforcement officers, and industry representatives should develop additional safety measures and awareness and training programs for drivers and handlers to reduce the incidence of such accidents.
- **Movement of corrosives and other hazardous materials that pose special hazards are of concern to State and local officials.** Emergency response personnel and planners should include industry in the development of appropriate response procedures and training programs that reflect the inherent dangers of these substances.
- **The most pressing nationwide training need is for intensified training for first responders.** First responders have initial responsibility in the mitigation of an incident or accident and need to be trained accordingly. Course offerings are currently weighted in favor of advanced instruction, leaving first responders inadequately informed. A multidisciplinary approach that includes all the agencies involved in first response is an important aspect of this training.
- **Additional and advanced training is appropriate for public safety personnel in large jurisdictions, along major transportation corridors, or in States with heavy concentrations of hazardous materials industries.** Funding assistance for training will be necessary for many jurisdictions, either from Federal or State programs or from user or registration fees.
- **Safety information accompanying hazardous materials often is not sufficient to enable emergency responders to protect themselves or the surrounding public in the case of an accident.**
- **Determining in advance who is to be in charge at an incident and the role(s) of each participating agency is imperative for an effective response.**
- **Good communication during emergencies requires adequate hardware and advance planning and coordination.**
- **National guidelines for appropriate protective clothing for specific hazardous materials emergencies are needed,** as hundreds of types of personal protective equipment are available for a variety of hazardous materials.
- **National guidelines for equipment standards and for training in equipment use would provide emergency response teams and public safety personnel with adequate skills and tools for a safe response.** Instruction in the maintenance, inspection, testing, and decontamination of personal protective equipment should be included in training programs.
- **Development of performance objectives for emergency response personnel would help standardize training and response.**
- **Hazardous materials emergency response training should include all transportation modes.**