IMPROVING TRAINING AND PUBLIC EDUCATION

The typical citizen seldom sees any reference to good safety records and prompt handling of hazardous materials incidents, or even very much about good preventive measures. Therefore, both the public and private sectors should consider a coordinated program of public education to both reduce the number and severity of incidents and to highlight the steps being taken to permit the relatively safe enjoyment of countless products. Telling each other about our good work and safety record is not achieving the goal of public understanding. Perhaps all organizations and agencies involved should pull together a set of goals for public education that reflect an accurate assessment of our national state of affairs.

It may be that the natural groupings of organizations—railroad, highway transporters, manufacturing chemists, public safety agencies, regulatory agencies, etc.—could establish a national consortium dedicated to preventive training, response training, and public education, viewing the task from at least a regional but preferably a national platform. Such a consortium could consider not only public education and the several critical training issues touched on here, but also such additional issues as improved training and public education technology and reduced program costs.

Segment II—Technical Training
Fred Halvorsen

Does a problem exist in the training of personnel to ensure the safe transportation of hazardous materials, substances, and wastes? Does the transportation of these materials present an unreasonable hazard to an unsuspecting populace because of training deficiencies in response forces? Are local officials adequately informed so that they can make logical and reasonable training decisions? Is better, more advanced training of all facets of the transportation industry the answer to the problem? Is there a problem at all? Who should do the training, and who should be trained, and in what?

In my estimation, many problems do exist and especially in certain areas of training for responding to hazardous materials incidents. However, equipment, techniques, and expertise are available to solve all existing and foreseeable problems if sufficient time, effort, and monies are expended. What is needed is not new or unique solutions, but redirection and reemphasis of existing resources, better guidance from responsible federal agencies, and, if beneficial change is to occur, commitment and involvement from federal and state officials at all levels of the problems confronting us.

CATEGORIES OF HAZARDOUS MATERIALS TRAINING

Basically, all training for hazardous materials can be divided into three major categories—prevention, initial response, and reflective response. Prevention refers to those actions of the industry and the regulatory authorities that seek to ensure that the product is properly classified, packaged, labeled, documented, and handled in transportation in a safe manner. Initial response refers to the actions of industry and the various local, state, and federal response agencies taken immediately after a hazardous materials accident or incident that seek to minimize and control the effects of the accident or incident. Reflective response refers to those actions that are directed at cleaning up, neutralizing, or mopping up the spilled material after the initial controlling response actions at a hazardous materials accident or incident.

Preventive Aspects

DOT through its MTB and four modal administrations writes and enforces the regulations that govern the classification, packaging, labeling, marking, placarding, and documentation of hazardous materials in transportation. The purpose of these regulations is to place the product in a package that will safely contain the product during the expected rigors of transportation. The federal agencies are extremely active in enforcing these regulations as well as in seeking voluntary compliance from the shipping industry. Civil fines up to $10,000/day per violation are possible and fines are used effectively throughout the industry to ensure compliance. Wide dissemination of fines awarded is accomplished by a monthly newsletter. Regulatory agencies also seek voluntary compliance from industry and some use fines only as a last resort. The U.S. Coast Guard, for example, has used on-the-spot compliance while holding up a shipment as an effective tool in many port areas.

Training inspectors for the preventative role is essentially essentially familiarization with the regulations followed by on-the-job training and experience. Inspectors can be effective immediately due to the fairly low risk involved and the fact that questions can be directed to superiors or directly to the MTB. As the inspector becomes more experienced, he or she becomes more effective and can check for more involved regulatory aspects. More importantly, industry has been extremely successful in voluntary compliance and, in many cases, industry's regulatory compliance efforts are more effective than those of the regulatory agencies. It is also important to note that besides the federal agencies, many states take an effective preventative role.

Overall, the effectiveness of the preventative aspect, which is basically compliance with the hazardous regulations in 49 CFR 170-179, is good and the training received is adequate. This evaluation is based on the number of accidents that can be attributed solely to lack of compliance with the regulations—historically, very few accidents can be so attributable.

Transportation incidents involving hazardous materials apparently occur proportionally to the number of vehicles carrying hazardous materials compared with the total number of vehicles. In other words, the presence of hazardous materials neither adds nor detracts from the possibility of a transportation incident.

Initial Response Aspects

If a transportation incident involving hazardous materials occurs, the responding personnel are most often, if not always, those response personnel who would respond to any transportation incident. Under many circumstances, it is likely that the first indication that hazardous materials are present is when the response personnel recognize through labeling, placarding, shipping papers, or from released product, or are told by the operator of the transportation vehicle that hazardous materials are involved. Their reactions at that point may be super critical. An incident improperly handled can become a serious accident or a catastrophe.

Unfortunately, the training that the first response personnel has likely received is minimal, if
at all, in the area of proper response to a hazardous materials incident. The technical qualification of response personnel in larger cities is usually better than small volunteer units but, in general, the technical competence and background of the majority of local and state police and firefighters is generally less than adequate. Few localities are aware of the type and quantity of hazardous materials moving incidently by rail or highway through their locales. For that matter, many are not aware of the type and quantities of hazardous materials even stored or used in their geographic area. Most also are not aware of the implications of the various physical, chemical, and toxicological properties of hazardous materials.

It is important to understand that this is not an indictment of this response sector, merely an observation on which action can be based. Note that the vast majority of initial response personnel will undoubtedly never be involved in an incident in which a hazardous material is released. Note also that the vast majority of initial response personnel do not have the technical background, time, or inclination to prepare for all the potential ramifications of a hazardous materials incident.

Much of the ability to respond to a hazardous materials incident is based on technical competence. Basically, we must be aware that a major education and training program will be a difficult and expensive objective.

Initial emergency response training is probably the least available type of training of all hazardous materials courses now available. The training usually is not offered at the location where it will be used, nor are persons who will be involved normally those who attend.

We must also question the training in light of the ability to use, hence reinforce, the education process. It is almost a catch-22 situation. The people who must be trained rarely use the training and because they do not use the training cannot be expected to properly apply the training in a real situation. Yet we are left with the uncomfortable fact that the initial response will be made and that the initial response personnel will undoubtedly be poorly prepared and inexperienced in responding to hazardous materials incidents.

Yet, the record is not unduly frightening. Hazardous materials incidents do occur and through great effort and frantic thought are fairly well handled by those who first respond. In many cases, with great personal risk, critical emergency decisions are carried out by initial response forces and potentially serious situations are corrected. Perhaps the worst is always expected when a hazardous material is released and the worst rarely occurs. In other words, we immediately expect the most serious consequences to ensue, even though improbably, and, when these dire consequences are not manifested, believe that the action taken was the correct action.

Personal risk to the initial response forces can be extremely high. Even if the material can be readily identified, the proper type of respirators, protective clothing, and detection equipment is not always available.

Reflective Response

Reflective response is the response by knowledgeable and experienced personnel usually after the initial response forces have reported to the scene. The reflective response forces, or reflective response forces, are those that have been made aware of the situation at the scene, have been given the time to consider the situation (reflect), and can respond with some degree of confidence in their actions. Personnel in this category include chemical shipping industry personnel, cleanup contractors, carrier representatives, federal on-scene coordinators (OSCs) and their forces, and trained local and state response forces. These personnel are experienced, since most are familiar with hazardous materials incidents. They have proper respiratory protection, contact protection, and detection equipment. A primary part of their job is to be prepared for such incidents and they can call on already established consultative services within and without their organizations for advice and council.

Onsite forces, however, have reached the scene of a hazardous materials incident, they should be expected to direct or give advice to the initial response forces.

The training of the reflective response forces is essentially through experience, involvement in past hazardous materials incidents, and technical training in scientific disciplines such as chemistry, physics, and engineering. There is also a tremendous amount of interest in providing qualified experienced reflective response personnel. The shipper gains credibility, the carrier controls his own property and equipment, and the commercial cleanup contractor makes money. The level of training of such persons is considered adequate.

WHERE TRAINING DEFICIENCIES EXIST

The one aspect of emergency response training that must be addressed is obviously the training of initial emergency response forces. Such persons consist of state and local police and local firefighters. To a lesser extent, the emergency medical teams and local disaster control and emergency preparedness personnel can be included.

These people have not received the training spotlight, so to speak, for a number of reasons. They are not employees of the federal government and able to use its large source of funds for training. They do not respond to hazardous materials incidents as a rule, and it may be difficult for them to perceive that training is needed even if they recognize the training deficiency in this area. It is difficult, if not impossible, for them to find funds or time for the training especially where travel is involved. Unlike cleanup contractors, they are not in private business and can profit from EPA, Coast Guard, or industrial contracts for cleanup or mitigation of a hazardous materials spill.

In addition, the hazardous materials training community has not specifically directed training at this group. Such training is not profitable or intellectually stimulating. The persons receiving the training may not feel comfortable in a training environment. Very simply, the initial emergency response forces have been left out of the training picture.

SPECIFIC TRAINING OBJECTIVES

In the future, perhaps exotic and sophisticated training objectives can be generated for initial response forces. In the interim, however, there are a few objectives that could be implemented to improve initial response force capabilities.

Preplanning-Contingency Plans

Some format should be generated for a local contingency plan and/or preplanning for a hazardous materials incident. An excellent example is the Manual for the Control of Hazardous Materials Spills by Qnderloy and Stone. However, this manual is quite
complicated for a small organization. It is suggested that much simpler versions be prepared and given wide dissemination.

Hazard Assessment-Sizeup of Situation

The greatest need is undoubtedly for a simplified, easily understood method of rapidly estimating the overall hazard at a hazardous materials incident. There are a number of such methods. However, one method should be universally adopted and highly publicized.

Protection Objectives

Only a certain number of tools are available to response forces who respond to a hazardous materials incident. These tools include evacuation, use of water and foam, diking with easily procured local materials, and the like. Whenever an action is taken, it should be to consciously gain an objective. The objectives should be the protection of life, property, or the environment. This concept of establishing protection objectives and taking action accordingly should be a primary training goal.

Use of Outside Expertise

When a hazardous materials incident occurs, there is a need for accurate, easily obtained, concise information for use in decisionmaking at the scene. The National Response Center (NRC) and the Chemical Manufacturers' Association's CHEMTREC are good starts on providing outside expertise or technical advice. However, there are many initial response personnel who are not familiar with CHEMTREC or the NRC. The functions and capabilities of both the NRC and CHEMTREC should be widely disseminated.

On another topic related to the use of technical experts outside the initial response organization, there have been some incidents where local forces have apparently been reluctant to use outside expertise. The philosophy should be to encourage the use of whatever expertise is available to the maximum extent possible.

BEST MEANS OF TRAINING

Over a period of years, in various training situations from the classroom to simulated exercises, many forms of training have been used. Some comments on each follow.

Classroom Lecture

This form of training is best suited as an introductory means only or to present chemical, physical, and toxicological information. The student does not participate, retention is usually poor, and the entire success of the program is placed on the instructor.

Hands-On Training

This form of training can be used effectively to teach the operation of specific items of equipment. This is best suited for equipment such as respirators, protective clothing, detection equipment, patching and plugging equipment, and decontamination procedures.

Case Studies

An effective training method in class is to pose hypothetical incidents involving hazardous materials and have the students walk through a response. All aspects of the exercise can be considered, and the other students can comment and critique the proposed response. The instructor must be quite familiar with the proper response techniques to make the exercise successful.

Mock Exercise

The most realistic, rewarding, and positive training situation is a mock exercise in which all potential players in a hazardous materials incident in a given locale are brought together. The players are then given a hazardous materials scenario, or series of scenarios, and must respond in their real-life roles. The exercise can be played with or without actually responding—for management personnel, the action can be quite effective if only described; for initial response personnel, the exercise would best be done by using equipment that the initial response personnel would normally use. After the exercise, the actions could be critiqued and evaluated, and organizational and future training decisions could then be based on the critiques. Personnel participating in the exercise should include all persons who normally would be involved at all levels of management in the local and state response organizations. Normally these people do not interact operationally until an incident occurs, and, before effective and concerted action can occur, they must sort themselves out. The mock exercise gives them the opportunity to establish command and control relationships, both formal and informal, in a simulated no-lose situation.

The Coast Guard has been conducting such exercises for Coast Guard and EPA personnel for the past two years. This exercise, the On-Scene Coordinator-Regional Response Team (OSC-RRT) Exercise, is meant to improve command and staff relationships between the federally designated OSC and the RRT, the advisory board. Thus far, the OSC-RRT Exercise has been limited to hypothetical spills of oil or hazardous substances (where a federal OSC is required), but the exercise could be extended to spills of hazardous materials as well.

Some caution must be used in training using a mock situation. Care must be used during the critique phase in order to avoid embarrassing any person or organizations. The positive aspects of the exercise must be emphasized. The group conducting the exercise should have no vested interest and be completely acceptable to the participants.

Standard Scenarios

However training is done and by whom, there is one training objective that could be easily accomplished. This objective should be to cover standard scenarios of hypothetical hazardous materials incidents. Each scenario could be used to emphasize one or more points. Wide publicity of these scenarios could help prepare all hazardous materials response forces for most potential emergencies and make them much better prepared for an unexpected emergency.

Ten hypothetical scenarios with some considerations that could be gained from the scenarios follow. These are not meant to be all-inclusive, merely representative:

1. Gasoline tank truck accident on busy city street, tank ruptures, no fire: fire and possible evacuation, water pollution—federal OSC involvement, diking and damming problem, and traffic and crowd control;
2. Liquefied flammable gas (LFG) rail tank car derailment, involving mechanical damage to car; tank
car structural integrity assessment, tank car righting and recapping, product transfer, and evacuation;
3. Water treatment plant, chlorine gas leak from one ton cylinder: protective clothing and respirators, evacuation, handling of leaking cylinder, and chlorine gas personnel casualties;
4. Large land storage tank, uncontrollable leak of oleum: personnel protection, digging and runoff control, and neutralization and cleanup;
5. Fire in pesticide and fertilizer warehouse: toxic vapors, toxic runoff, use of water, personnel protection and decontamination, and follow-up personnel monitoring;
6. Undamaged LFG pressurized storage tank, direct fire involvement: "BLEVE" potential, evacuation, uncontrollable situation, and commitment of initial response forces;
7. Abandoned chemical waste dump site, gas venting, liquid leaching problems: population hazard evaluation, federal involvement, cleanup potential and site control, and handling of unknown chemicals;
8. Ammonia gas release, many gas inhalation injuries: handling of casualties and evacuation;
9. Freight marshalling yard, freight container leaking unknown liquid product: product identification and hazard evaluation, shipper-carrier involvement, waste generation, and liquid containment and diking; and
10. Spill of persistent pesticide onto an environmentally sensitive area: groundwater survey and hydrology, cleanup, and level of cleanliness, detection equipment, and long-term effect.

**WHO SHOULD BE RESPONSIBLE FOR TRAINING?**

As outlined previously, the segment of the hazardous materials response forces most in need of training is the initial response force. This force will not be trained by the states in most cases because money, time, and, in many instances, interest are lacking. If initial response forces are to be trained, a federal effort is indicated. Private industry has leaped into the training arena in the prevention category, mainly to take advantage of the training aspect of the Transportation Safety Act of 1974 training requirements and, more recently, all the training and education aspects created by the 311(k) fund of the Federal Water Pollution Control Act. Most recently, the new "superfund" legislation has created a tremendous training interest in the areas of toxicology, hazardous wastes, and long-term cleanup.

The lead role in hazardous materials training should logically rest with FEMA or DOT. As stated, DOT has set up an emergency response center at the NRC manned by the U.S. Coast Guard and does have some initial response forces in the U.S. Coast Guard but their role is somewhat limited geographically. DOT also has established a new emergency response coordinator in MTB, but this is just one person and seems more politically oriented than safety oriented. DOT also has seeded private regional training, evacuation, handling of leaking cylinder, and chlorine gas personnel casualties.

**SOME SUGGESTIONS FOR THE FUTURE**

As a basis for discussion, the following suggestions are proposed:

1. That a single training center for hazardous materials training be established by the federal government, preferably outside of the Washington, D.C., area; potential locations are DOT's Transportation Safety Institute or FEMA's National Fire Academy (the initial thrust of this training would be toward training of initial response forces);
2. That the training center offer both resident and road-show type training;
3. That standard texts and lesson plans be prepared at the center for use in satellite courses;
4. That funding for the program be provided through a combined federal government-industry funding program such that in the superfund legislation for spill cleanup; and
5. That the curriculum be established by representatives of interested federal agencies, interested state agencies, representatives of chemical manufacturers, shippers, and carriers, and most importantly, representatives of fire service personnel.

**Emergency Response**


The response to an emergency incident involving hazardous materials brings together the public- and private-sector emergency response teams under stress conditions. Each emergency response team has a differing purpose and motivation for being on the scene. The public emergency response teams are there to protect the public safety, health, and property. The transportation system emergency response teams are there to clean up and restore the system back to normal as quickly and safely as possible. The hazardous material manufacturer is there to provide advice and/or assistance in his or her areas of chemical expertise, public health, environmental concerns, and safety. With such diverse purposes, the need for preplanning and operational strategies and the recognition of decisionmakers are very important. The reaction of the initial responders, the public emergency agencies, is of utmost importance; but these are the people least likely to be knowledgeable in the handling of hazardous material incidents. Training programs designed to meet the needs of the local public emergency people are necessary. There is a need for communication channels to be opened so that the barriers between the responding groups can be eliminated. Traditional methods of operations need to be reviewed because many are not appropriate in today's urban or transportation environments. But, most important is the need for the change by all parties from one of mistrust to one of trust and respect.

**AS VIEWED BY THE PUBLIC FIRE SERVICE**

The purpose of this conference is to help develop a national strategy that will address several concerns related to hazardous materials. This paper discusses some of the issues that relate to emergency response and to a hazardous materials accident. The points raised and views expressed are ones in which I not only believe but also have heard expressed by several of my colleagues in the fire service.

**Role of Public and Private Sectors**

In many discussions about hazardous materials, a popular topic is the appropriate roles of the public and private sectors. There are usually several points of view put forth, depending on which sector...