

Hazardous Materials Shipment Information for Emergency Response

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Fire fighters and police often must respond to accidents involving trucks or trains carrying hazardous materials or to other incidents involving the release of hazardous materials in transportation. To deal with such events, responders need information about the materials involved in order to apply appropriate fire fighting, clean-up, and disposal methods and decide whether evacuations or traffic diversions are needed. Regulations require that shipments of hazardous materials be identified by shipping documents accompanying them and placards on vehicles, but lack of necessary information at the scene of incidents has sometimes delayed response and increased risks.

Central Reporting System Proposal

To improve information at hazardous materials transportation incidents, it was proposed in legislation introduced in the U.S. Congress to create a national computerized central reporting system and data center, into which federal law would require shippers and carriers to enter a record of each hazardous materials shipment in the data center at the commencement and completion of the shipment. At the time of an incident, local police and fire fighters would have immediate access to the data center. Through the vehicle's license plate or other number, responders could identify any hazardous materials on board. The legislation has not been enacted.

The proposal has been controversial. In statements to Congress and elsewhere, proponents have argued that the system would overcome inadequacies in existing procedures for providing information that threaten the



Emergency responder wearing protective gear in training exercise.

safety of fire fighters and the public. Opponents, including shipper and carrier industry groups and the U.S. Department of Transportation, have argued that the proposed system would be expensive to implement and vulnerable to the human errors that are the source of malfunctions in the current information system. They also maintain that the current system of placards and shipping papers works adequately and that the information that would be provided by the national central reporting system could affect the outcome of only a small fraction of hazardous materials transportation incidents.

TRB Policy Study

In the Hazardous Materials Transportation Uniform Safety Act of 1990, Congress called on the National Academy of Sciences to study the feasibility and necessity of such a central reporting system. The study was funded by the Research and Special Programs Administration of DOT and has been completed by a committee organized by the Transportation Research Board and chaired by Barry M.

Horowitz, President of the MITRE Corporation. (See box for committee roster.)

The committee's task was to assess the opposing viewpoints and recommend actions for improving emergency responder access to information. The committee concluded that improvements to the current system are necessary and that information technology might help overcome some, but not all, of the system's problems. The committee recommended reforms involving appropriate applications of information technology; improvements in regulation, enforcement, and training; and evaluation of the current system so that efforts can be directed at the most pressing problems. (See box for summary of recommendations.)

The committee recommended that the government not attempt to implement immediately the central reporting system that had been proposed originally. The original proposal was not based on a thorough understanding of emergency responders' needs, nor was it designed to integrate with shipper and carrier information systems.

Information Problems at Incidents

Past failure to conduct evaluations is a serious handicap to present efforts to strengthen the information system. The committee found that there has never been a comprehensive evaluation of the information needs of emergency responders at hazardous materials transportation incidents or of the performance of the current system in providing information.

To begin to fill these gaps in understanding, the committee reviewed incident records, interviewed emergency responders and managers in industries responsible for hazardous materials handling, and conducted case studies of consequential incidents (that is, incidents involving injury, substantial prop-

erty damage, evacuation, or major traffic delay). The case studies were supplemented with descriptions of consequential incidents investigated by the National Transportation Safety Board. The 125 cases developed provided a small representative data base for analysis.

Among the case studies, in about 25 percent of consequential highway incidents and 10 percent of consequential rail incidents, emergency responders could not obtain information that they sought or experienced significant delay in obtaining it. In the remaining incidents, the system performed adequately: responders acquired credible information in the format required by regulations. In those incidents with information deficiencies, the deficiencies did not necessarily cause the adverse consequences. If the case study rates apply to the nation as a whole, roughly 200 consequential incidents occur nationwide each year in which emergency response information would be seriously deficient. The committee identified six categories of information failure in the case studies. (See box.)

Because the causes of the failures are complex, the committee concluded that reducing the frequency of failures would require extensive changes in regulation, enforcement, and training. Automated information systems could complement these needed changes, but they would not substitute for them. Automated systems might help responders deal with complex situations by organizing information, strengthen enforcement by creating a monitoring mechanism, or incorporate features to reduce the likelihood of human errors.

The benefit of improved information would be some reduction in the costs of hazardous materials incidents: injuries, property damage, and the disruptions of evacuations



Training exercise by Santa Fe Railway simulates derailment of car containing hazardous material. Responders drape car with plastic sheets to minimize exposure to moisture.

and traffic delays. However, because most of these costs are not the result of poor information, improved information could produce only fractional cost savings. In addition to its value in routine events, improved information might help avoid some consequences of rare but catastrophic hazardous materials incidents.

Applications for Automation

The committee concluded that an automated information system for emergency responders could be reliable and cost-effective only if it built on shippers' and carriers' own information systems. Shipper and carrier systems for shipment tracking and inventory control, as well as application of electronic data interchange in transportation, are rapidly developing in sophistication, but use of these technologies by small and medium-sized firms remains very limited.

To find cost-effective technology applica-

tions, the committee recommended that DOT test prototype automated systems and described an information system for rail shipments as a practical starting point. The proposed limited start-up would give emergency responders access to rail industry car-tracking and way-bill data systems. All large railroads provide current information to shippers describing the location and recent movements of rail cars carrying their shipments. The information can be provided over computer networks or by way of synthesized voice messages over ordinary telephones. These systems could be modified to provide information about car contents to emergency responders.

The prototype would provide an experimental setting for addressing many of the organizational, technical, and cost-effectiveness issues that any emergency response information system would face. It would be conducted with the voluntary participation of at least one large railroad and several emergency response agencies in the railroad's territory. The evaluation would include a comparison of the timeliness and reliability of materials identification using the prototype with the reliability of using current methods. The committee estimated the cost of the prototype and evaluations at \$4 million to \$7 million.

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Left: California freeway was closed for several hours when cartons of corrosive swimming pool chemicals fell from truck. Right: Fire in truck carrying hazardous materials on Ohio highway led to evacuation of 2,000 residents and closure of road for 36 hours.



Committee for Assessment of a National Hazardous Materials Shipments Identification System

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Committee Recommendations

1. Improvements to the current system for providing information to emergency responders at hazardous materials transportation incidents are necessary. Congress, DOT, and other responsible federal agencies should plan and carry out a program to improve the system. This program should include appropriate measures to apply technology; reforms in regulation, enforcement, and training; and evaluation of the existing system so that efforts can be directed at the most pressing problems.

2. DOT should undertake one or more limited start-ups of automated information systems. The start-ups should be controlled experiments with rigorously designed evaluation protocols.

3. DOT should, on an ongoing basis and in conjunction with industry and responders, systematically investigate opportunities for application of information technology to aid responders and reduce the costs of hazardous materials incidents.

4. The U.S. Fire Administration, DOT, and other federal, state, and local agencies that maintain data bases of hazardous materials incidents should coordinate to ensure that data collection is designed to serve evaluation and research needs.

5. DOT should establish a monitoring capability that allows it to determine whether its regulations intended to provide emergency responders with information at hazardous materials transportation incidents are working adequately.

6. DOT, together with other responsible federal agencies, should form a plan of action to alleviate each of the information failures identified in this study through changes in regulations, more effective enforcement, and support for improved training of emergency responders and inspectors.

7. DOT, the U.S. Fire Administration, and state and local emergency response agencies should jointly conduct a study of costs and means of organizing and delivering training to hazardous materials emergency responders and enforcement officers.

8. The government should not attempt to implement a system such as the originally proposed national central reporting system—that is, one entailing immediate and universal application of a requirement for shipper or carrier real-time filing of vehicle contents information in a central data base.

Information Failures in Hazardous Materials Transportation Incidents

- Required sources of information, such as placards and shipping papers, were missing or inaccurate.
- Placards, shipping papers, or other information sources were obscured, destroyed, or inaccessible because of a crash, fire, or threat of fire, explosion, or toxic exposure.
- Information sources were in compliance with regulations and accessible, but they failed to efficiently convey important information to responders.
- Information was insufficient because the material or shipment was exempt from some federal hazardous materials transportation regulations (because quantities were too small to require placarding, the material was not regarded as being in transport, or the material was not designated as hazardous in regulations).
- The vehicle operator was unprepared to provide information.
- Responders failed to obtain or use available information.