The Role of Hazardous Material Placards In Transportation Safety and Security

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EXECUTIVE SUMMARY

Following the events of September 11, 2001, the U.S. Department of Transportation (DOT) has taken steps to reduce vulnerabilities of hazardous materials in transportation through security enhancing initiatives directed at reducing their potential use in a terrorist event. As part of this effort, the DOT evaluated existing safety regulations to ascertain whether they detracted from efforts to enhance security. While it is agreed that existing safety regulations generally enhance security, some have called into question the hazardous materials placarding requirements. They have argued that placards, which are important for communicating the presence of hazardous materials, also might aid a terrorist in identifying hazardous materials in transportation and have suggested that placards should be removed and that an alternative to placards should be provided.

In response to placarding concerns, the Research and Special Programs Administration (RSPA), Office of Hazardous Materials Safety (OHMS) conducted a review of the use of placards on shipments of hazardous materials from the perspective of both safety and security. To ensure an informed review, OHMS sponsored two workshops with participants with expertise in security, hazmat shipping, public safety and emergency response, and relevant alternative communication technologies. The workshops took into account professional experiences as well as other research, most notably findings from a related study conducted by the National Academy of Sciences (NAS). Alternatives to the current U.S. placarding system that would improve the security of shipments of hazardous materials, without compromising or degrading safety, were evaluated.

The results of the review can be summarized as follows:

- **Placards are critical sources of hazard information.** Placards are an integral part of an internationally harmonized system of communicating the hazards of hazardous materials in transportation and play a critical role in communicating the presence of hazardous materials to emergency responders in the event of a hazardous materials incident, to transport workers and to regulatory enforcement personnel.

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- **Placards provide information about hazards, but not necessarily about commodities.** Placards could not be relied on as a single source of information for ascertaining the presence of hazardous materials in sufficient quantity for carrying out a significant terrorist attack as placards may also be found on transport units containing only residues of hazardous materials. Placards depict a hazard type. There is frequently a wide range of substances posing the same type of hazard with the lower hazard materials posing a lesser security threat, yet all of these substances may be identified by the same placard.

- **Effective emergency response is a critical component of security.** Effective emergency response plays a critical role in combating terrorism by reducing its appeal as an effective

means of warfare. In that placards reduce or eliminate the disruptive effects of terrorism through effective emergency response they also enhance security.

- **Enhancing security through alternative means is more appropriate than replacing placarding.** This study evaluated both operational procedures and technological alternatives to placards. These alternatives are largely considered as enhancements to the security of hazardous materials not as replacements for placards except on a limited scale for extremely high-risk materials.

- **The Department of Transportation is currently working to enhance hazmat security.** The DOT and industry have taken considerable steps to enhance the security of hazardous materials in transportation. Some of DOT's steps include the publication of security advisories identifying measures industry should take; the proposed development and implementation of security plans through the formal rulemaking process; extensive outreach activities on security, including security sensitivity visits to motor carriers; and solicitation of public comments on the feasibility of specific security enhancements that include technological and operational measures. DOT has also developed new programs to improve security awareness, such as a CD-based basic awareness security training program that has been widely disseminated. On the technology side, the Department has initiated an operational evaluation of cutting-edge communication and tracking technology, electronic seals and biometric identification. The regulated industries are also taking steps to implement voluntary security measures that include developing company specific security plans, issuing security guidelines, maintaining continual contact between drivers and company dispatchers, evaluating routes from a security perspective and enhancing the overall level of security awareness among their hazardous materials employees.

This study concludes that the existing placarding system should be retained; and as DOT continues to develop a comprehensive security program for hazardous materials transportation, it should continue to review the use of operational procedures and technological developments as security enhancements and as alternatives to placards in specific high risk situations as well as for broad application. In considering potential changes to its placarding requirements as a result of its continuing review, DOT will have to take into account the considerable impacts on cost, training and international trade that changes to placarding requirements could have.

THE ROLE OF HAZARDOUS MATERIAL PLACARDS IN TRANSPORTATION SAFETY AND SECURITY

1.0 INTRODUCTION

In the United States, approximately 800,000 shipments of hazardous materials are transported each day in bulk and in smaller shipment configurations. In regard to bulk rail shipments, the industry uses roughly 200,000 rail tank cars. A subset of these cars moves over 275,000 shipments of chlorine, anhydrous ammonia, propane gas, and gasoline every year. The motor carrier industry dedicates more than 400,000 large trucks to the transportation of hazardous materials. A subset of this fleet participates in approximately 18,000,000 shipments of gasoline and 125,000 shipments of explosives a year.

Placards are currently required on these and other conveyances used in the transportation of hazardous materials. The placards serve as an easily identifiable, visual source of information used by millions of workers in the transportation, public safety, and hazmat industries. Placards identify the general type of hazard associated with the hazardous materials and may also identify the specific hazardous material. Placards are part of a well-established international hazmat communication system. They help regulators working in compliance and enforcement ensure that hazardous materials shipments are transported in a safe manner consistent with the regulations, help transportation workers identify hazmat shipments so that they can be handled appropriately, and help emergency responders quickly ascertain the nature of the hazard that they face in the case of an accident or spill.

Based on intelligence received, the threat to hazardous materials cargoes by terrorists is a very real concern. This raises the question whether placards are detrimental to security interests. Some in the industry and security communities believe that terrorists may use placards to help identify targets of opportunity for destruction or shipments they can hijack or steal and use in planned attacks. Because of these concerns, it has been suggested that an alternative to placards should be developed and employed.

1.1 Purpose of Report

In response to these concerns, the Research and Special Programs Administration (RSPA) Office of Hazardous Materials Safety (OHMS) conducted a review to address the use of placards on shipments of hazardous materials from the perspective of both safety and security. OHMS sought to gain insight into whether the use of placards creates a security risk and if there are any alternatives to placards or existing placarding requirements that are readily available and would improve the security of shipments of hazardous materials without compromising or degrading safety. This report documents the findings and recommendations from this review.

1.2 Scope of Review

OHMS sponsored two Hazardous Materials Placarding Workshops that brought together experts in the fields of hazardous materials; public safety and emergency response; information and navigation technology and communications; and security to address the related safety and security impacts of maintaining the current placarding requirements or transitioning to an alternative, such as using advanced information and communications technologies for all or selected hazardous materials. The first workshop, held September 24, 2002, in Washington, D.C., focused on the role of placards in shipping hazardous materials and in security, the use of automated systems and technologies for shipment identification and tracking, and the trade-offs between safety and security. The list of attendees and the agenda for this workshop are contained in Appendices B and C.

In the second workshop, held October 24, 2002, the panel of experts provided comments to the draft report developed from the first workshop and additional insights into the role of placards. The list of attendees and the agenda for this workshop are contained in Appendices D and E.

1.3 Previous Activity

In the Hazardous Materials Transportation Uniform Safety Act of 1990, Congress mandated that the U.S. Department of Transportation (DOT) contract with the National Academy of Sciences (NAS) to conduct a study of the feasibility and necessity of establishing and operating a central reporting system and computerized telecommunications data center that would receive, store, and retrieve data on all daily shipments of hazardous materials by all modes.[1]

In 1993, the NAS Committee for Assessment of National Hazardous Materials Shipments Identification System completed Transportation Research Board (TRB) Special Report 239, *Hazardous Materials Shipment Information for Emergency Response*. The NAS Committee found that, in most instances, the existing hazardous materials communication systems worked and the information sources available at the scene of a hazardous materials incident met the critical information needs of emergency responders. Although the committee recommended that the government should not attempt to implement the proposed national reporting system, it did note that a program should be established to improve the existing system. This program should include (1) appropriate measures to apply technology; (2) reforms in regulation, enforcement, and training; and (3) evaluation of the existing system so that efforts can be directed at the most pressing problems.[2] The study also concluded that development of a technology-based information system would not be a substitute for needed regulatory, enforcement, or training improvements, but technological aids might complement such improvements.

In January 1994, as required by the Hazardous Materials Transportation Uniform Safety Act of 1990[3], the Secretary submitted a *Report to Congress on Improvements to Hazardous Materials*

[1] Hazardous Materials Transportation Uniform Safety Act of 1990 (Pubic Law 101-615), Section 25.
[2] National Research Council, Committee for the Assessment of a National Hazardous Materials Identification System, *Hazardous Materials Shipment Information for Emergency Response*, TRB Special Report 239, National Academy Press, Washington, D.C., 1993, pp. 2-3.
[3] Hazardous Materials Transportation Uniform Safety Act of 1990 (Public Law 101-615), Section 25.

Identification Systems that summarized the NAS report and agreed with the NAS recommendation that a national central reporting system should not be implemented and that Congress take no further action. The DOT also stated that, while some improvements may be appropriate, the existing system provides a satisfactory level of safety when properly implemented in compliance with existing regulations.[4]

Government and industry have taken considerable steps to enhance the security of hazmat in transportation since September 11, 2001. As part of its effort, the U.S. Department of Transportation (DOT) considered placarding in the light of security concerns and concluded that at this time the benefits of placards far outweigh their potential for use by terrorists. In 2002, the DOT prepared a draft position paper "Transportation Security and Placarded Hazardous Materials Shipments." In this paper, the DOT recommended that the Department should not initiate action to remove placards from hazardous materials shipments.[5]

The paper stated that removing placards would have minimal effect on the overall security of hazardous materials in transportation. The paper addressed three major detrimental effects of removing placards:

- Removal would inhibit state and local governments' ability to respond effectively to hazardous materials accidents and place fire fighters, police, other emergency responders, the public, and the environment at risk.
- Removal would make it more difficult for transport workers to assure that hazardous materials are handled safely and efficiently.
- Removal would cause serious disruptions to international transportation of hazardous materials and would undermine efforts to promote regulatory uniformity at the United Nations and other international organizations.[6]

The paper concluded that removing placards would not deter or prevent a determined attack. It also stated that a sophisticated terrorist would not need placards to identify possible targets of opportunity.[7]

1.4 Current Initiatives

A number of governmental and industry initiatives are underway to enhance the security of hazardous materials shipments. By enhancing hazmat security, these initiatives, although not alternatives to placards, reduce the overall security threat and lessen any need to replace placards. The initiatives are highlighted below and are discussed in more detail in Sections 3.3. and 3.4.

The DOT initiatives include:

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[4] *Report to Congress on Improvements to Hazardous Materials Identification Systems*, U.S. Department of Transportation, Washington, D.C., January 1994, pp. i-ii.
[5] "Transportation Security and Placarded Hazardous Materials Shipments," U.S. Department of Transportation, Washington, D.C., draft, 2002, p. 1.
[6] Ibid.
[7] Ibid., p. 3.

- RSPA has issued a security advisory that identified actions that could be implemented to enhance the security of hazmat shipments. (Published in the *Federal Register* on February 14, 2002, at 67 FR 6963.)
- RSPA designed the Risk Management Self-Evaluation Framework to assist entities in assessing and managing security risk. (Completed and available on RSPA's website at URL hazmat.dot.gov.)
- RSPA issued a Notice of Proposed Rulemaking that proposed shippers and carriers develop and implement security plans. (Published in the *Federal Register* on May 2, 2002, at 67 FR 22028.)
- RSPA has created and distributed a Security Awareness Training CD. (Released in November 2002.)
- In conjunction with the Federal Motor Carrier Safety Administration (FMCSA), RSPA issued an Advance Notice of Proposed Rulemaking inviting comments on the feasibility of specific security enhancements. (Published in the *Federal Register* on July 16, 2002, at 67 FR 46622.)
- FMCSA has met with over 43,000 motor carriers to discuss steps to improve security. (Published in Report to Congress, "FMCSA's Security Sensitivity Visits," January 31, 2002, and updated in FMCSA's Security Actions and Plan on June 24, 2002.)
- FMCSA has implemented currently on-going security-related training that has been attended by approximately 11,000 individuals so far. (Implemented in February 2002.)
- FMCSA has commissioned a technology operational evaluation that will examine the role of advance technology can play in mitigating security vulnerabilities. The assessment will evaluate the potential of cutting-edge communication and tracking technology, electronic seals, and biometric identification to enhance security. (Published in FMCSA Press Release on September 6, 2002.)
- FRA is actively working with the Association of American Railroads, and with short-line and regional railroads, to assess security risks and reduce them. FRA has reviewed a high-level railroad industry security assessment commissioned by AAR, offered its suggestions, and will be working with the industry to implement the actions raised by the report.

Both the shipper and transport industries have also created anti-terrorism action plans, the principal goal of which is to ensure that a vehicle or its cargo are not used as a weapon. This involves a campaign including awareness and development of specific deterrence, containment, and response strategies.

2.0 ROLE OF PLACARDS IN HAZMAT SAFETY

Placards are a source of information identifying the type of hazard the hazardous material being shipped poses. They are a key component of an international system of hazard communication that also includes shipping paper, package marking and labeling requirements. The primary function of placards is to provide initial warning information in the event of an incident involving a shipment of hazardous materials. The prominent display of the diamond-shaped placard is intended to immediately warn responders, handlers, and bystanders that hazards are present and reduce the chance of someone inadvertently entering an incident site.

In addition to their emergency response function, placards also alert transport workers to the presence of a hazardous material in a specific shipment, assuring that the shipment is handled safely and in conformance with regulatory requirements. Placards are part of an internationally harmonized hazard communication system. Placarding requirements are also integrated into state and local requirements. For example, they are frequently used to control the movement of certain hazardous materials through tunnels, over bridges and over certain routes.

2.1 Current Placarding Requirements

As previously mentioned, placards are diamond-shaped (square-on-point) signs that are used to identify shipments of hazardous materials. When required, placards must be placed on both ends and both sides of trucks, railcars, and intermodal containers that carry hazardous materials. They are coded by color and contain symbols and numbers that designate the hazard class or division of the hazardous material that is being shipped. For bulk and certain non-bulk shipments, a four-digit hazardous material identification number may be on the placard or on an accompanying orange panel or a white square-on-point sign. As an illustration, Figure 2.1 shows the placard for flammable gas (white letters on a red background).

FIGURE 2.1. PLACARD INDICATING FLAMMABLE GAS

Placards are required for the transportation of hazardous materials, based on the type and quantity of material. In Federal law, a hazardous material is defined as

> a substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and has designated as hazardous under . . . Federal hazardous materials transportation law.[8]

Hazardous materials are broken into nine hazard classes:

1. Explosives
2. Gases
3. Flammable and combustible liquids
4. Flammable solids, spontaneously combustible materials, and dangerous when wet materials
5. Oxidizers and organic peroxides
6. Toxic (poison or poisonous) material and infectious substances
7. Radioactive materials
8. Corrosive materials
9. Miscellaneous dangerous goods.[9]

The single digit at the bottom of the placard shown in Figure 2.1 is the hazard class.

Federal hazardous materials regulations divide the hazard classes into two placarding tables. For hazardous materials listed in Table 1 in the regulations, placards must be displayed to identify any quantity of material. Table 1 material includes high explosives, poison gas, dangerous when wet material, some organic peroxides, poison inhalation material, and certain radioactive material.[10]

For hazardous materials listed in Table 2 in the regulations, placards must be displayed to identify a quantity of material over 1,001 pounds. Table 2 material includes other explosives, flammable and non-flammable gas, flammable and combustible liquids, flammable solids, spontaneously combustible material, oxidizers, some organic peroxides, poisons that do not pose an inhalation hazard, and corrosive material.[11]

As discussed in Section 3, Federal hazardous material regulations[12] may require other markings, such as proper shipping names and material identification numbers[13], for certain bulk commodities as well as markings for other materials, such as materials poisonous by inhalation, marine pollutants, and elevated temperature materials. The application of these markings varies according to the volume or class of the hazardous material being shipped. At a minimum,

[8] HMR, Title 49 CFR Part 171.8.
[9] HMR , Title 49 CFR Part 172.504.
[10] Ibid.
[11] Ibid.
[12] HMR, 49 CFR Part 172 Subpart D
[13] Material identification numbers are specified in HMR, 49 CFR Part 172.101

markings are required on two opposing sides of the vehicle or container. For specific volumes or commodities, the markings must be located on each end and each side of the vehicle or container.[14]

Workshop participants highlighted that placards do not give very specific product information. Other readily available sources of information can be used to determine the risks associated with specific hazardous materials shipments, including the shipments' locations, the shapes of the containers and packagings, as well as markings and labels, identification numbers, shipping papers, and other relevant documents.

2.2 International System

U.S. placarding requirements are based on the United Nations' (U.N.) Model Regulation on the Transport of Dangerous Goods that provides the basis for transportation of hazardous materials worldwide. The provisions are widely adopted into national and international regulations.

The U.N. Model Regulation covers all aspects of transportation necessary to provide international uniformity including a system of communicating the hazards of substances in transport through hazard communication requirements which cover labeling and marking of packages, placarding of tanks and freight units, and documentation and emergency response information that is required to accompany each shipment. Virtually all hazardous materials imported to and exported from the United States are transported in accordance with international regulations based on the U.N. Model Regulation. The volume of these shipments has an estimated value of $160 billion annually.[15]

The U.N. Model Regulation provides the basis for the International Maritime Dangerous Goods (IMDG) Code, which is the international code for the transport of dangerous goods by sea. The IMDG Code specifies how shipments should be marked, labeled, placarded, and documented.[16] Today, at least 150 countries whose combined merchant fleets account for more than 98 percent of the world's gross tonnage use the IMDG Code as a basis for regulating sea transport of hazardous materials.[17]

Under the North American Free Trade Agreement, representatives of the governments of the United States, Canada, and Mexico have harmonized the hazardous materials placarding requirements of the three countries. The departments of transportation of these three countries also jointly publish and distribute the *2000 Emergency Response Guidebook (ERG2000)*.[18]

The ERG2000 is

[14] HMR, 49 CFR Part 172 Subpart D
[15] U.S. DOT/RSPA, November 2002.
[16] IMO and dangerous goods at sea, www.imo.org, May 1996
[17] U.S. DOT/RSPA, hazmat.dot.gov/imdg.htm
[18] U.S. DOT/RSPA, hazmat.dot.gov/nafta.htm

> a guide to aid first responders in quickly identifying the specific or generic hazards of the material(s) involved in the incident, and protecting themselves and the general public during the initial response phase of the incident.[19]

The guidebook provides information on the potential hazards of the material, actions to take to protect the safety of the responders and general public, and responses to take to mitigate the effects of fires, spills, and leaks.

TRB Special Report 239 found that removal of placards would cause serious disruptions to international transportation of hazardous materials and would undermine efforts to promote regulatory uniformity at the United Nations and other international organizations. The participants at the September 24 workshop echoed and detailed these concerns. Participants emphasized that the placarding system is just one piece of an integrated international system. Changes to the placarding requirements could dramatically affect U.S. trade in chemicals, potentially causing major disruptions at U.S. seaports, as well as at Canadian and Mexican border crossings.

2.3 Emergency Response

Workshop participants stressed that placards usually give fire fighters, police, and other emergency responders at an incident the first indication that a hazardous material is present. Visible placards allow the emergency personnel to assess the situation from a distance and reduce the possibility that these responders will be exposed unnecessarily to a dangerous material. Emergency responders use the information provided by the placard in conjunction with other sources, such as the *ERG2000*, to decide on their course of action for handling an incident involving a hazardous material.

A principal finding of TRB Special Report 239 was that the removal of placards would significantly inhibit state and local governments' ability to respond effectively to hazardous materials incidents and place fire fighters, police, other emergency responders, the public, and the environment at risk. This finding was strongly endorsed by attendees at the September 24 Hazardous Materials Placarding Workshop. Representatives strongly expressed the opinion that the removal of placarding would substantially endanger emergency responders and reduce the effectiveness of response. The elimination of the placarding information would also cause emergency response units to treat any incident as though it were the most dangerous type of hazardous materials incident until lesser conditions of severity could be established. Thus, low-level hazardous material incidents or even non-hazardous material incidents would be responded to slowly and carefully with resultant delays and disruption.

The impact of these delays and disruptions should not be underestimated. Substantial sections of major highways would more frequently be shut down in the absence of placards than they are now, tying up traffic and severely restricting mobility and compromising safety. Secondary accidents resulting from highway incidents are a major cause of death and injury to emergency responders. Evacuations of those in businesses, residences, and institutions, such as schools, hospitals, and sports arenas would also occur more frequently. A timely and effective

[19] *2000 Emergency Response Guidebook*, p. 2

emergency response can significantly mitigate some events and in that sense may be considered a deterrent to terrorism.

More "secure" technological alternatives, although possibly providing higher quality information, would do so only for those responders with the equipment required to receive such enhanced information, assuming the proper functioning of information sources and the required readers or receivers. These responders constitute more than a million individuals representing various sized agencies, ranging from the full-time police, fire, and emergency units of major metropolitan areas to small community volunteer groups. A substantial portion of the country is protected by volunteer fire departments. Resources for these departments are limited and turnover is high, making training difficult. The frequency of serious hazmat incidents occurring in these areas is substantial. Attendees at the workshop felt that equipping and training such units with any technological alternatives would be both extremely costly and time-consuming.

2.4 Transport Worker Safety

Placards also convey easily seen and understood information to transport workers so that they can safely handle the transportation of hazardous materials. For example, placards help rail workers to ensure the proper placement of railcars containing hazardous materials and proper switching procedures. For the purposes of workplace safety, placards are maintained on railcars and motor vehicles containing hazardous materials delivered to a facility until the hazardous materials are unloaded. Both domestic and international transport workers, English-speaking and non-English-speaking, rely on placarding as a visual clue that the container being handled contains a material that must be handled in a certain way for the safety of the worker. As with emergency response, workshop participants echo the finding in TRB Special Report 239 that removal would make it more difficult for transport workers to assure that hazardous materials are handled safely and efficiently.

2.5 Safety Regulation

Currently, safety regulations cover the transportation of hazardous materials, including the vehicle, operator training, transport company expertise and procedures, shipment routing, and storage. Placards serve as a mechanism for ensuring compliance with state and local routing requirements. Placards alert public safety agencies and the general public as to the content of containers and permit visual identification of shipments for the purpose of determining whether those shipments are on prohibited routes, tunnels, or bridges, or are being stored or offloaded in prohibited areas. The removal of the placarding system would potentially eliminate key information for safety enforcement officials, such as police and fire, in the case of either unintentional or willful violations. The elimination of placards would also preclude other interested parties, such as the operators of truck storage yards and tunnel and bridge authorities, from detecting violations.

The substitution of technological alternatives for placards would eliminate the visual cues available to the regulatory authorities and the public alike relative to the regulation of hazardous materials. At a minimum, an infrastructure of radio frequency (RF) tags, invisible markings, or some other more "secure" system would need to be developed to make up for this loss.

Additionally, electronic readers would need to be distributed to emergency responders; Federal, state, and local security personnel; industry workers; and Federal, state, and local regulatory personnel, all of whom would also need training in their use and maintenance. Groups outside of these selected stakeholders would lose the ability to be aware of hazardous materials shipments. Safety regulation would, consequently, become more expensive and less effective.

2.6 Training

Any change to the existing, well established hazmat transportation and safety system would require training. Participants at the September 24 workshop expressed wide-ranging concerns about the need for extensive training to accommodate any change in the current placarding system. That training would be needed at all levels by both industry and emergency responders, both paid and volunteer. Several speakers pointed out that there are several hundred thousand people handling approximately 1.2 million hazardous materials movements a day who rely on the current placarding system to safely accomplish their jobs. These are in addition to more than one million first responders who may be called upon to deal with a hazardous materials incident. All of these people would require some level of training to accommodate any significant change in the placarding system. If technological alternatives are introduced to replace placards, emergency responders and some portion of the shipment handlers will need to be trained in and equipped for the new technology. Participants also noted that any such training would be expensive and take many years to accomplish.

2.7 Hazmat Safety Conclusions

The participants at the September 24 workshop agreed that the main purpose of placards is to *provide information* -- to indicate that hazardous material is being shipped and the potential risks of that material. They noted that first responders, emergency responders, and even the general public, would use this information when there has been an incident. Transport workers in their day-to-day handling of hazardous material and the containers in which it is transported and enforcement personnel in their daily regulatory activities also use the information.

The use of placards also represents a system that is international in scope and easily understood. Through the use of colors, symbols, and hazard class/division numbers, the placards identify the hazardous material being shipped. It is part of a system for which millions of emergency response personnel and transport workers have been trained, one that is used and recognized worldwide. Because the current placarding system is so tightly integrated into the national hazardous materials safety program, replacing it would be costly, take a long time, and entail a significant amount of training.

3.0 HAZMAT SECURITY

Following the terrorist attack of September 11, 2001, the interest in hazmat security escalated enormously. Based upon intelligence information, the threat to hazardous materials cargoes by terrorists is a very real concern. In fact, terrorists have used hazmat overseas on previous occasions.

Prior to that, the security of hazmat shipments was largely overshadowed at the national level by public safety concerns related to hazmat incidents. Many shippers and carriers already had loss prevention programs in place to prevent a shipment from being lost or stolen.

At the September 24 Hazardous Materials Placarding Workshop, the representative from OHS noted that placards convey information useful to terrorists seeking opportunities for creating disruptions in the U.S. Acknowledging the destructive potential from the sabotage of hazardous materials in transportation, OHS is concerned that the current placarding system would facilitate the identification of a hazmat shipment that could then be commandeered for an attack within the U.S.

Sophisticated terrorist attacks, such as the bombings of the USS Cole and the U.S. Embassies in Kenya and Tanzania and the September 11 events, are well-funded and planned over a course of years. It was noted at the September 24 workshop that a planning horizon of up to two years is not uncommon for the more sophisticated terror assaults. For such well planned attacks, removal of placards offers little to no security benefit as other sources of information on hazmat cargoes exist. On the opposite side of the spectrum, a minimally planned or opportunistic attack would require a convergence of events where a hazmat shipment of sufficient quantity and volatility is either at the target location or within driving distance of a critical target without the possibility of interception by local authorities. A placard on the shipment may indicate the hazard of the material, but it indicates nothing about the quantity, which limits the usefulness of the information to a terrorist. In fact, placarded containers are often empty and contain only residue, and consequently many placarded loads do not pose a serious security threat. Thus, the placard itself does not provide sufficient information to guarantee a successful terrorist operation.

The previous section highlighted the extensive public safety concerns and potential costs associated with removing placards or changing the placarding system. This section addresses two related concerns with changing the placarding system: (1) what other sources of information might potential terrorists be able to exploit in the absence of placards, and (2) do viable alternatives for the placarding system exist. The section also presents information on the activities currently being undertaken by the DOT and industry to enhance the security of hazmat shipments and lessen any need to replace placards.

3.1 Other Ways to Identify Hazmat Shipments

A placard is a visible source of information to both the informed and uninformed adversary. It is only one of many sources of information, however, that could be used in a terrorist attack.

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3.2 Alternatives to Placards

This section examines the application of technologies or the introduction of procedural or operational changes in the specific context of reducing the threat of terrorism against hazmat shipments. The alternatives explored are grouped into two basic categories: (1) operational and (2) high-technology. For the purposes of this discussion, an operational approach is defined as an approach adopting new procedures to replace the current placarding system. A high-technology approach is defined as an approach utilizing vehicle tracking or monitoring solutions, or comprehensive information and communications systems to replace the current placarding system.

The focus of the discussion in this section is on replacing the placarding system. Activities by government and industry to enhance the security of the placarding system are addressed in Sections 3.3 and 3.4. The Working Group concluded that none of the options discussed in this section are comprehensive alternatives to placarding. If the placarding system were to be replaced by an alternative, a transition period would be needed where both systems (the current placarding system and its replacement) are used until emergency responders and other users gained sufficient confidence in the new system.

3.2.1 Operational Approaches

Operational approaches are attractive due to their relative ease and speed of implementation when compared with high-technology approaches. The only operational approach considered worthy of consideration was to remove placards and markings and provide vehicle escorts.

Providing Vehicle Escorts. On the positive side, removing placards and markings would make vehicles/conveyances transporting hazmat more difficult for terrorists to identify and compromise. Furthermore, implementation could begin relatively quickly. On the negative side, removing markings, however, would make hazmat vehicles more difficult for emergency responders, transport workers, and regulatory enforcement personnel to identify. Such markings are also used by industry for purposes of operational efficiency and safety, including avoiding inadvertent loading of incompatible cargoes. It might be noted that the U.S. Department of Energy already escorts some shipments without placards.

Vehicle escorts would deter the hijacking of hazmat vehicles or the theft of hazmat that is being shipped. Armed escorts might be able to intervene, and even unarmed escorts could report to local authorities that a hijacking or theft was in progress. Vehicle escorts could provide information to emergency responders concerning the contents of a shipment, should an incident occur. Furthermore, they might be able to help in the case of an incident if they include emergency responders. Implementation of vehicle escorts could be accomplished quickly. The presence of escorts could tip off terrorists that a shipment contained something of interest, such as hazardous materials. Escorts would only be practical for selected extremely high-danger hazmat shipments, rather than for all shipments.

Providing escorts would significantly increase the costs of transporting hazardous materials. If no shipments had markings and only some shipments had escorts, then the safety of the shipments without escorts would be compromised. Escorts would help other transport workers and emergency responders perform their jobs by providing needed information and assistance, unless incapacitated by an incident.

The pros and cons of providing vehicle escorts may be summarized as follows:

<u>Pros</u>

- Eliminates placards as an information source for a terrorist to identify a hazmat shipment.
- Deters theft of a hazmat shipment by terrorists.
- Requires no new technological developments.
- Implementing vehicle escorts could be accomplished in a relatively short period of time.

<u>Cons</u>

- The costs of implementing vehicle escorts are expected to be high.
- Given the enormous number of hazmat shipments transported each day, implementing vehicle escorts is expected to be very labor intensive, even if only selected hazmat commodities are escorted.

- Considerable safety and security training will be required for prospective escort personnel before vehicle escorts can be implemented on an operational basis.
- Enforcement personnel will not be able to readily identify hazmat shipments, making enforcement of hazmat regulations more difficult.
- Industry personnel will not be able to readily identify hazmat shipments, making their proper handling more problematic.
- Emergency responders may not be able to readily identify hazmat shipments involved in incidents, particularly when the incident involves the vehicle escort, or when escort personnel are incapacitated by the hazmat cargo (e.g., toxic gas release).
- The presence of an escort could be a clue that hazmat is being transported.

3.2.2 High-Technology Approaches

Commercially available off-the-shelf technologies exist that could be applied to enhance the safety and security of hazmat shipments. It is beyond the scope of this report to address all possible technologies and perform detailed benefit-cost analyses. The discussion will focus on those technologies discussed at the workshops and their role in mitigating the threat of terrorism. The three high-technology approaches discussed in this section are (1) radio frequency identification tags (RFID), (2) vehicle tracking and monitoring technologies, and (3) enhanced information systems.

As noted at the October 24, workshop, the time needed to implement the high-technology approaches will be proportional to the money spent on implementation. Even with an unlimited budget, all alternatives are expected to take several years to fully implement.

RFID Tags. RFID tags are small inexpensive electronic devices designed to contain information that can be retrieved at a distance using a specialized reader, the most common example being the tags used for toll collection on highways. Because an RFID tag requires specialized equipment to be read, it helps to mitigate the vulnerability of a terrorist identifying a hazmat shipment by sight alone. Depending on the tag used by the shipper, however, a terrorist may be able to purchase an off-the-shelf reader and use it to identify the contents of a shipment. While RFID tags are relatively inexpensive per vehicle, there would be a significant infrastructure cost that would include the cost of providing portable readers to emergency responders and transport workers. RFID tags could be encoded with more information than a placard alone could provide, which should enhance emergency response.

The railroad industry has installed two RFID tags (known in the railroad industry as Automatic Equipment Identification [AEI] tags) on every freight car and locomotive in the US and Canada. Railroads use the AEI information for confirming train consists, and are beginning to use the AEI information to identify specific cars that have been flagged by wayside equipment defect detectors. AEI tags are passive and contain only vehicle initial and number and the number of wheels on the vehicle. They cost about $125 per car set to purchase and install. Active battery-powered read-write AEI tags that can accommodate commodity information are also available. AEI readers cost about $25,000 per installation, with a large portion of that cost being for power supply, foundations, and communications links.

The standards and protocols adopted by the Association of American Railroads for the railroad AEI tags are the same as those adopted by the American Trucking Associations for truck RFID tags and by the International Standards Organization for container RFID tags. The only difference is that AEI tagging is mandatory for rail cars, and voluntary for trucks and containers.

A number of limitations and impediments to implementing RFID tags exist. These include the high cost for implementation of a tag system capable of relaying information on hazardous materials, and the need, if implemented, to distribute millions of pieces of equipment to industry and emergency responders. RFID tags could require emergency responders to come closer to transport vehicles to read the tag, thereby placing themselves in greater danger. Additional limitations include the need to train personnel in industry and the emergency response community on how to use RFID tags, as well as the need to maintain the readers and other equipment associated with RFID tags. This training and maintenance would drive the total costs of using RFID tags even higher.

Key pros and cons of providing RFID tags may be summarized as follows:

Pros

- RFID tags replace visible placards, and provide a source of information about a shipment involved in an incident (provided emergency responder has reader and the RFID tag has not been damaged in the incident).
- RFID tags are a proven technology and are currently and widely available.

Cons

- Emergency responders would be placed at greater risk in order to read the RFID tags.
- The costs of replacing placards with an RFID tag system would be expected to be extremely high.
- An RFID tag system would require extensive training of emergency responders, industry personnel, security personnel, and regulatory enforcement personnel.
- An RFID tag system would take several years to properly implement, and therefore could not be quickly used to enhance security.
- A common standard based on current industry practices would need to be adopted before an RFID tag system could be implemented.
- Deploying readers to emergency responders and all others who would need them could present an obstacle to successful implementation of an RFID tag system because of the massive number of people who would have a legitimate need for those readers.
- RFID tag readers could be readily obtained and used by terrorists to identify hazmat shipments.

Vehicle Tracking Systems. Vehicle tracking systems allow the remote monitoring of the location and condition of a vehicle from a central location. Generally in vehicle tracking systems, a tracking device located on a vehicle will use the Global Positioning System (GPS) to determine its own location and then, using a separate communications pathway, report that location back to a central monitoring facility. Communication choices fall into three basic

categories: (1) satellite, (2) terrestrial network (such as a cellular phone network), or (3) conventional radio. It does not matter which system is selected as long as the shipment will be traveling within the communications coverage area.

Tracking systems provide a near real-time link to the vehicle and may be used to monitor many different aspects of a shipment. Examples include monitoring for trailer break-ins using alarm sensors on a trailer, monitoring for a shipment deviating from a predetermined course (usually referred to as geo-fencing), monitoring for an antenna cable being cut (which hijackers may do as a first step to stealing a truck and its cargo), or a driver-activated single stroke emergency alert feature.

Vehicle tracking systems may be used to respond to terrorist attacks in a variety of ways. One is to render the vehicle inoperable by turning off the engine, making hijacking significantly more difficult and risky for a terrorist. Commercial technology with this functionality is available and currently in use by industry and the U.S. Government. To function effectively, vehicle tracking devices must be augmented by staff at a monitoring site who dispatch local emergency responders, as is the case with systems operated by the U.S. Department of Energy for radioactive waste and special weapon components, and by the U.S. Department of Defense for shipments of conventional weapons and explosives. It should be noted that these systems are currently used mostly by larger carriers, at least in part because of their expense and the lack of a need by many shippers and carriers of hazmat.

Figure 3.4 is a simplified representation of the flow of data through a generic satellite-based vehicle tracking system. GPS is used to calculate the position of the vehicle. This position information is then broadcast to a satellite. Once received at the satellite, the information is then transmitted back down to the satellite service provider's ground station. The ground station in turn formats the data and delivers it to the customer's application. The ground station can usually transmit data to more that one location, providing a redundant pathway to increase system reliability. In addition, when emergency or critical messages are received, the data may be routed over another network to staff at the site where the information was received who can contact emergency responders.

The railroad industry and the Federal Railroad Administration are working on the development of Positive Train Control (PTC) systems. PTC systems are comprised of digital data link communications networks, continuous and accurate positioning systems such as the Nationwide Differential Global Positioning System (NDGPS), on-board computers with digitized maps on locomotives and maintenance-of-way equipment, in-cab displays, throttle-brake interfaces on locomotives, wayside interface units at switches and wayside detectors, and control center computers and displays. These systems will track the precise location of all trains and all the cars that are on the trains. PTC systems will prevent train collisions and overspeed accidents, and will also have the capability of remote intervention as well as the insuring only authorized personnel are operating the trains.

The limitations to using vehicle tracking include the high cost of the infrastructure needed for implementation and the lack of a universal standard, which would be needed if a universal system were to be implemented. An effective system of communicating an incident to

emergency responders anywhere in the United States does not currently exist and would need to be provided for this system to be viable as a replacement to placarding. If vehicle tracking were to be used in place of placards, the information needs of transport workers and regulatory enforcement personnel would not be met.

Key pros and cons of a vehicle tracking/remote monitoring system may be summarized as follows:

Pros

- A vehicle tracking/remote monitoring system replaces visible placards.
- A vehicle tracking/remote monitoring system could provide emergency alert capability based on driver activation.
- Some larger carriers already employ carrier-level vehicle tracking/remote monitoring systems for business and/or safety and security reasons.
- A vehicle tracking/remote monitoring system could allow dispatchers or others knowledgeable about a shipment to contact emergency responders in the case of an incident.
- Vehicle tracking/remote monitoring is currently available.
- Vehicle tracking/remote monitoring systems have been proven to enhance the safety and security of shipments

Cons

- The costs of implementing a vehicle tracking/remote monitoring system for hazardous materials would be enormous. Costs would include adding the necessary communications equipment to vehicles; establishing, staffing, and operating monitoring stations; and training industry, emergency responders, regulatory enforcement personnel, and security personnel needing to use the system.
- The costs of implementing a vehicle tracking/remote monitoring system would be a relatively greater burden on small carriers than on larger carriers. It could force some smaller carriers out of the hazmat transport business.
- Implementing a vehicle tracking/remote monitoring system would require additional training for industry personnel, transport workers, emergency responders, security personnel, and regulatory enforcement personnel.
- A vehicle tracking/remote monitoring system would take years to fully implement.
- Emergency alert, a feature of the system, could not be activated if the driver is incapacitated.
- Failure of the system due to communications outages, power outages, strikes, fires at monitoring stations, and other situations could adversely impact emergency response.

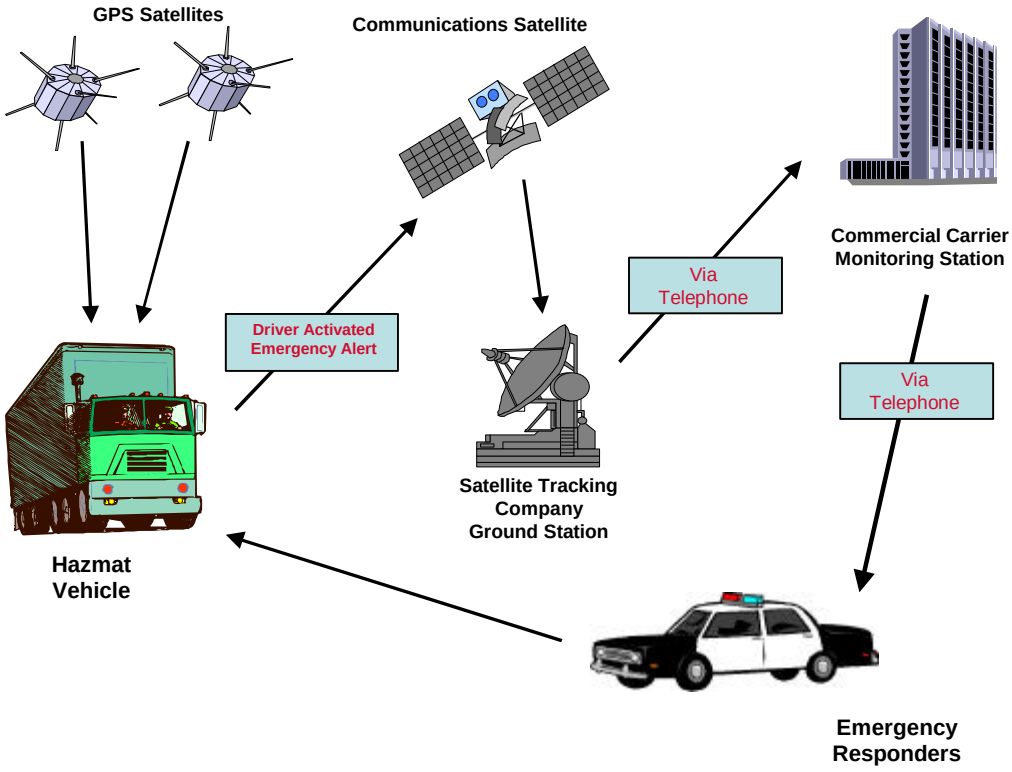

FIGURE 3.4. SATELLITE-BASED VEHICLE TRACKING EXAMPLE

- For acceptable operational systems, a standard would need to be agreed upon that provided all the information needed by emergency responders. That standard would probably need to be national in scope.
- A vehicle tracking/remote monitoring system has several potential failure points that terrorists could focus on, including but not limited to the transceiver antenna on the vehicle being tracked/monitored and the monitoring station.
- While a vehicle tracking system might provide the information needed by emergency responders, it does not address the needs of the general public, transport workers, security personnel, or regulatory enforcement personnel.

Centralized Information System. If all shipments were recorded in a centralized information system, then emergency responders could access the system through a call center or a web site from an incident scene and find specific information about a shipment. This system, it must be noted, does not currently exist.

Currently, regulations require that shipping papers include an emergency response telephone number that emergency responders can call to find out information about a shipment if an incident occurs. Many decentralized systems providing this information currently exist. They

are typically operated by the firm itself, by an independent contractor, or as a service of an industry group, such as the American Chemistry Council's CHEMTREC organization.

A centralized information system, if well implemented, could provide significantly more information to the first responder than the current placarding system. Furthermore, in a well-implemented system, emergency responders could call about any incident and be confident that they would receive the information they need if the incident involved hazmat. Alternatively, if a centralized information system were combined with a vehicle tracking/monitoring system, the information about an incident could be "pushed" to responders on the way to the incident scene. Of course, using a centralized system in place of the current placarding system would deny potential terrorists a source of information.

Significant implementation barriers exist, however. Those barriers include costs and the lack of communications infrastructure and equipment needed to facilitate emergency responders accessing information in the system. There is also the challenge of making the system accessible to emergency responders while protecting it from unauthorized access by terrorists. All vehicles would require some marking to identify them to the centralized information system. Finally, in the absence of any type of placarding, there would be no overt method on the vehicle/ conveyance to warn the public of the dangerous nature of the cargo, and emergency responders would have to take a precautionary approach and assume that all incidents involved hazmat until notified otherwise.

Key pros and cons of a centralized information system may be summarized as follows:

<u>Pros</u>

- A centralized information system would replace visible placards.
- A centralized information system would provide a place that emergency responders could call for detailed information about a shipment in the case of an incident.

<u>Cons</u>

- A centralized information system is not currently available.
- The cost of a centralized information system would be enormous.
- For a centralized nationwide system, a data standard for submission and retrieval of information would need to be adopted. That data standard would need to include data security controls that not only prevented terrorists from gaining access to information, but also protected proprietary business information of shippers and carriers from competitors.
- Emergency responders, industry personnel, security personnel, and regulatory enforcement personnel would all need extensive training before a centralized information system could be successfully implemented.
- Implementation of a centralized information system would take years. The time needed would be for training, establishing a standard for the system, and establishing the necessary physical and communications facilities (including backups).
- Even a temporary failure of system would adversely impact emergency response, and furthermore would be expected to have a impact lasting long after the failure had been

resolved because it would take time for emergency responders to begin to trust the system again.

- A centralized information system would provide an inviting potential target for terrorists. Knocking out such a system, even temporarily, would have a significant impact on the safety of hazmat transport.
- A centralized information system would provide no easy method of informing the public, regulatory enforcement personnel, transport workers, or security personnel of the hazardous nature of a cargo moving over the nation's transportation system. To allow some or all of these groups to query the system concerning "randomly" selected shipments would endanger the security of the system and also increase the size of the system over what would be necessary for emergency response.

3.3 Current Department of Transportation Hazmat Security Activities

An understanding of the new risks associated with hazmat shipping after September 11, 2001, gave rise to many security initiatives in government, industry, and the public safety community. They include proposed new regulations, awareness campaigns, vulnerability studies, and measures to harden physical facilities. This section describes some of the current activities underway within the DOT, other federal agencies and industry focusing on improving the security of hazmat transport.

Responsibility for hazmat transport regulations resides with the DOT's Research and Special Programs Administration (RSPA). Other agencies including the Federal Motor Carrier Safety Administration (FMCSA), the Federal Railroad Administration (FRA), the Federal Aviation Administration, and the United States Coast Guard are responsible for modal aspects of transportation. Many of the new activities of the DOT enhance security without removing placards. These activities show that there are many more effective methods for addressing hazardous materials transportation security risks than removing placards from transport vehicles or containers. Furthermore, by reducing the overall security threat, these activities lessen any need to remove placards.

3.3.1 Research and Special Programs Administration

RSPA has undertaken a number of actions to enhance the security of hazardous materials shipments:

Security Advisory. In a Security Advisory published in the *Federal Register* on February 14, 2002, RSPA identified a number of actions that those involved in the transportation of hazardous materials could implement to enhance security and recommended actions commensurate with the level of threat posed by the specific hazardous material being transported.[20] To improve en route security, RSPA recommended that shippers and carriers consider utilizing advanced technology to track or protect shipments en route to their destinations. Such tracking technology could include satellite tracking or surveillance systems or could be as simple as frequent checks with drivers by cell phone to ensure everything is in order. The Security Advisory also recommended actions shippers and carriers could take to address personnel and facility security issues.

[20] See 67 *Federal Register* 6963, February 14, 2002.

Risk Management Self-Evaluation Framework. To assist hazardous materials shippers and transporters in evaluating risks and implementing measures to reduce those risks, RSPA designed a security template for the Risk Management Self-Evaluation Framework (RMSEF). RMSEF is a tool developed through a public process to assist regulators, shippers, carriers, and emergency response personnel to examine their operations, and consider how they assess and manage risk. The security template illustrates how risk management methodology can be used to identify points in the transportation process where security procedures should be enhanced within the context of an overall risk management strategy. The RMSEF security template is posted on line at http://hazmat.dot.gov/rmsef.htm.

Security Plan NPRM. In a Notice of Proposed Rulemaking (NPRM) published on May 2, 2002, RSPA proposed that shippers and carriers develop and implement security plans for certain, high-risk shipments of hazardous materials.[21] The security plan would be based on a risk assessment performed by the shipper or carrier to identify security risks and develop appropriate measures to reduce or eliminate risk. As proposed, a security plan must include measures to improve en route security; such measures could include shipment tracking or monitoring systems. In addition, RSPA proposed revisions to current shipping documentation requirements to assist law enforcement personnel to promptly ascertain the legitimacy of hazardous materials shipments during routine or random roadside inspections and to identify suspicious or questionable situations where additional investigation may be necessary. A final rule should be published early in 2003.

Hazmat Transportation Security Awareness Training Module 2002. The Office of Hazardous Materials Safety has prepared a Hazardous Materials Transportation Security Awareness Training Module 2002 on CD-ROM. This training module provides basic hazmat transportation security general awareness training. The training module provides an introduction to hazmat security, identification of potential targets and threats, and tools for law enforcement, industry and the hazmat community to increase hazmat security. The tools on the CD-ROM include (a) guidelines for conducting a vulnerability assessment, (b) security review checklists for hazmat shippers, carriers and receivers, (c) guidelines for employment background checks, and (d) guidelines for facility security. The CD-ROM, released in November 2002, is being offered for free by OHMS and can be obtained by telephone, e-mail, or on-line.

Joint ANRPM on Security Enhancements. On July 16, 2002, RSPA and FMCSA issued a joint Advance Notice of Proposed Rulemaking (ANPRM) inviting comments on the feasibility of specific security enhancements and the potential costs and benefits of deploying such enhancements.[22] Security measures being considered include: escorts; vehicle tracking and monitoring systems; remote vehicle shut-offs; direct short-range communications; and notifications to state and local authorities. The comment period closed on November 15, 2002. Comments are being reviewed with the expectation that a Notice of Proposed Rulemaking (NPRM) will be issued by July 2003.

[21] See 67 *Federal Register* 22028, May 2, 2002.
[22] 67 *Federal Register* 46622, July 16, 2002.

3.3.2 Federal Motor Carrier Safety Administration

Since September 11, 2001, the FMCSA has been working extensively with the motor carrier industry, including that segment devoted to the transport of hazmat, to improve motor carrier security.

Security Sensitivity Visits. Subsequent to September 11, 2001, the FMCSA undertook motor carrier "security sensitivity visits." This effort involved personal visits by inspectors to some 43,000 motor carriers. During those visits, the inspectors stressed the need for safety and security of motor carrier facilities, hiring practices and vehicles. Information about this effort was published in the Report to Congress, "FMCSA's Security Sensitivity Visits," January 31, 2002, and updated in FMCSA's Security Actions and Plan, June 24, 2002.

Security Training Program. An 8-hour long training program was recently developed to address security. It deals with detection of anomalies, and covers security planning, including threat assessment, incident prevention, routing and markings. This training program, developed in Fall 2001 and implemented in February 2002, is currently on-going. To date, it has been presented to approximately 11,000 individuals in cooperation with law enforcement organizations.

Technology Operational Test. The FMCSA commissioned a technology operational test in September 2002[23] that will examine the role that advanced technology can play in mitigating security vulnerabilities. The assessment will include cutting-edge communications and tracking technology, electronic seals, and biometric identification to evaluate their potential for enhancing security. The goal of the two-year effort is to identify and recommend technology and operational measures that will provide a cost-effective means to protect different types of hazardous cargo.

3.3.3 Federal Railroad Administration

The FRA is working with the Association of American Railroads, the American Short Line and Regional Railroad Association, the American Public Transportation Association, Amtrak, the American Chemistry Council, the Chlorine Institute, freight shippers, private car owners, and unions to enhance security in the railroad industry.

Positive Train Control. The railroad industry and the FRA are working on the development of Positive Train Control (PTC) systems that, in addition to enhancing railroad safety and efficiency, will enhance railroad security through the continuous, real-time monitoring of the location and speed of all trains and maintenance vehicles, as well as the continuous monitoring of all switches. Only authorized persons will be able to operate trains. PTC will provide for the on-board enforcement of all movement authorities, and will also provide a capability for remote intervention.

[23] See FMCSA Press Release, September 6, 2002.

3.3.4 Other DOT and Federal Agencies

Other security initiatives of the Department are the result of efforts to secure borders while maintaining the efficiency of the current logistics system, and are hence concerned with securing shipments along the entire supply chain. These are being carried out in concert with the Coast Guard and Customs and other outside agencies, and include such activities as "Operation Safe Commerce." The emphasis in these activities is on containers, and involves transparency of the container as it moves through the logistics system. Both the location and the integrity of the shipment are monitored. These initiatives also enhance hazmat security.

In addition, the USA Patriot Act directs the DOT to develop a rule requiring all individuals with a commercial driver's license (CDL) who request a hazmat endorsement to undergo a criminal background check prior to receiving that endorsement. The Transportation Security Administration (TSA) is responsible for implementing this requirement.

3.4 Current Industry Hazmat Security Activities

Many industry groups and companies are involved in activities to enhance their security. Industry security activities relating to transportation include the following.

3.4.1 Motor Carrier Industry

American Trucking Associations (ATA). The motor carrier industry's trade association umbrella, the American Trucking Associations (ATA), has created an "Anti-Terrorism Action Plan," the principal goal of which is to ensure that a truck or its cargo are not used as a weapon. This involves a campaign including awareness and development of preparedness and response strategies.

3.4.2 Railroad Industry

Association of American Railroads (AAR). The AAR is a trade association representing the major freight railroads in the U.S., Canada, and Mexico. Roughly, its members, which are primarily Class I railroads, represent about 80 percent of the U.S. railroad industry and 90 percent of all U.S. hazmat shipments moving by rail.

Last year, according to its website, the AAR "implemented a comprehensive security plan based on a thorough risk analysis of the industry."[24] Additional actions in the area of security undertaken by the AAR include

- A 24 hour a day/7 day a week operations center to provide a secure communications link between railroad control centers and transportation and law enforcement agencies
- Restricted access to railroad facilities and equipment
- Heightened railway employee security awareness
- Increased surveillance of critical railway infrastructure (e.g., bridges and tunnels)

[24] AAR at http://www.aar.org/Index.asp?NCID=1052.

U.S. Railroads. The U.S. railroads, unlike any other transportation companies in the country, have their own police forces with independent, multi-jurisdictional authority. Under Federal law, implemented by regulation, a railroad police officer, commissioned in a state, has authority in any jurisdiction in which the railroad owns property.[25] Consequently, the railroads are not wholly reliant on local, state, and Federal law enforcement agencies for protection of railroad property, equipment, and infrastructure.

Railroads, working with the AAR, have implemented security plans. As mentioned above, heightened employee security awareness is one of the key elements in these plans. It is reported that the Union Pacific Railroad's plan, for instance, "…requires engineers and conductors to report abnormal stoppages to dispatchers, and asks dispatchers to notify their supervisors when trains are stopped in odd places."[26] On its website, the Union Pacific has posted a telephone number to be used by anyone noticing "…unusual or suspicious activities on UP trains or property (open loaded railcars or containers, vandalized track or signals, or suspicious individuals on railroad property)….".[27]

3.4.3 Chemical and Hazmat Industries

Industry groups, including the American Chemistry Council (ACC) and the Chlorine Institute have been involved since September 11, 2001, with improving the security of their members. The ACC has taken a lead role in the efforts being made by the chemical and hazmat industries.

The ACC is a trade group representing more than 90 percent of the productive capacity of basic industrial chemicals in the U.S. and a large portion of the regulated hazardous materials shipping community. "Transportation Security Guidelines for the U.S. Chemical Industry" has been published by the ACC. A new version was released in June 2002. The Chlorine Institute, CHEMTREC, the Compressed Gas Association, and the National Association of Chemical Distributors all have endorsed this publication. The guidelines are available on the ACC website (www.americanchemistry.com), as well as on the Chlorine Institute website (www.cl2.com/security.htm). The transportation security guidelines developed by the ACC complement site security guidelines developed by the organization.[28]

In addition in June 2002, the ACC "…adopted a mandatory Responsible Care® Security Code for its members and its Responsible Care® Partners."[29] This code

> …applies to all operations of a chemical company, including site operations, value chain activities and cyber activities. The purpose of the Security Code is to help protect people, property, products, processes, information and information systems by enhancing

[25] See 49 U.S.C. 28101 and 49 CFR Part 207.
[26] Newsday at http://www.newsday.com/news/nationworld/wire/sns-ap-terror-warning-trains1025oct25,0,7800125.story?coll=sns-ap-nationworld-headlines.
[27] Union Pacific at http://www.uprr.com/she/.
[28] See "Site Security Guidelines for the U.S. Chemical Industry," October 2002, at http:www.americanchemistry.com.
[29] "Implementation Resource Guide for Responsible Care® Security Code of Management Practices: Value Chain Activities," American Chemistry Council, September 2002, p. 4.

security, including security against potential terrorist attack, throughout the chemical industry value chain.[30]

3.5 Hazmat Security Conclusions

It is clear that security concerns related to hazmat shipments are real and that placards are one way for terrorists to identify a hazmat shipment. This review has also clearly established, however, that

- Removing placards would not significantly improve security because there are many useful alternative sources of information that terrorists could use to identify hazmat shipments for theft or destruction, especially as part of a planned terrorist attack.

- Except for a limited number of high-hazard shipments, replacing placards is not an option to improving security in the near term because viable alternatives to placarding could not be quickly implemented throughout the U.S. Many of the technologies are available, but the required systems development and deployment will take considerable time and resources. For safety reasons, it would not be prudent to replace placards until an alternative was satisfactorily demonstrated as effective and responders were trained and equipped.

- **This sentence is protected under FOIA Exemption 3 and Title 49 CFR Part 1520 as Sensitive Security Information.**

[30] [30] "Implementation Resource Guide for Responsible Care® Security Code of Management Practices: Value Chain Activities," American Chemistry Council, September 2002, p. 4.

4.0 CONCLUSION

This study has reviewed the existing placarding system as it applies to the shipment of hazardous materials and concludes that, on balance, the existing placarding system should be retained. The events of September 11, 2001, illustrated the need to reconsider the security of such shipments as well as their safety. The DOT continues to develop a comprehensive security program for hazardous materials transportation and should continue to review the use of operational procedures and technological developments as security enhancements and as alternatives to placards in specific high-risk situations, as well as for broad application. In considering potential changes to its placarding requirements as a result of its continuing review, DOT will continue to weigh the security risks, as well as the impacts on direct costs, including training, and the implications for international trade, that changes to placarding requirements could have.

Following the events of September 11, 2001, the DOT took steps to reduce vulnerabilities of hazardous materials in transportation through security enhancing initiatives directed at reducing their potential use in a terrorist event. As part of this effort, the DOT evaluated existing safety regulations to ascertain whether they detracted from efforts to enhance security. Safety regulations generally enhance security, although this has been called into question in the case of hazardous materials placarding requirements. Some have argued that placards, which are important for communicating the presence of hazardous materials, also might aid a terrorist in identifying hazardous materials in transportation and have suggested that placards should be removed and that an alternative to placards should be provided.

In response to these concerns, RSPA's Office of Hazardous Materials Safety (OHMS) conducted a review of the use of placards on shipments of hazardous materials from the perspective of both safety and security. To ensure an informed review, OHMS-sponsored workshops on September 24 and October 24 with participants who had a demonstrated expertise in security, hazmat shipping, public safety and emergency response, and relevant alternative communication technologies. The review of the use of placards took into account the professional judgment and experience of the workshop attendees, as well as other relevant research, most notably findings from a related study conducted by the National Academy of Sciences. Alternatives to the current U.S. placarding system that might improve the security of shipments of hazardous materials, without compromising or degrading safety, were evaluated. These included both operational and high technology alternatives.

The results of the review can be summarized as follows:

- **Placards are critical sources of hazard information.** Placards are an integral part of an internationally harmonized system of communicating the hazards of hazardous materials in transportation and play a critical role in communicating the presence of hazardous materials to emergency responders in the event of a hazardous materials incident, to transport workers and to regulatory enforcement personnel.

  This section is protected under FOIA Exemption 3 and Title 49 CFR Part 1520 as Sensitive Security Information.

- **Placards provide information about hazards, but not necessarily about commodities.** Placards could not be relied on as a single source of information for ascertaining the presence of hazardous materials in sufficient quantity for carrying out a significant terrorist attack as placards may also be found on transport units containing only residues of hazardous materials.

- **Effective emergency response is a critical component of security.** Effective emergency response plays a critical role in combating terrorism by reducing its appeal as an effective means of warfare. In that placards reduce or eliminate the disruptive effects of terrorism through effective emergency response they also enhance security.

- **Enhancing security through alternative means is more appropriate than replacing placarding.** This study evaluated both operational procedures and technological alternatives to placards. These alternatives are largely considered as enhancements to the security of hazardous materials not as replacements for placards except on a limited scale for extremely high-risk materials.

- **The Department of Transportation is currently working to enhance hazmat security.** The DOT and industry have taken considerable steps to enhance the security of hazardous materials in transportation. Some of DOT's steps include (1) the publication of security advisories identifying measures industry should take, (2) the proposed development and implementation of security plans through the formal rulemaking process, (3) extensive outreach activities on security, including security sensitivity visits to motor carriers, and (4) solicitation of public comments on the feasibility of specific security enhancements that include technological and operational measures. DOT has also developed new programs to improve security awareness, such as a CD-based basic awareness security training program that has been widely disseminated. On the technology side, DOT has initiated an operational evaluation of cutting-edge communication and tracking technology, electronic seals and biometric identification. The regulated industries are also taking steps to implement voluntary security measures including (1) developing company specific security plans, (2) issuing security guidelines, (3) maintaining continuous contact between drivers and company dispatchers, (4) evaluating routes from a security perspective and (5) enhancing the overall level of security awareness among their hazardous materials employees.

Considering these factors, it would be premature to recommend the removal of placards from shipments of hazardous materials.

APPENDIX A
GLOSSARY

AAR	Association of American Railroads
ACC	American Chemical Council
AEI	Automatic Equipment Identification
ANPRM	Advance Notice of Proposed Rulemaking
ATA	American Trucking Associations
CB	citizen band
CFR	Code of Federal Regulations
CDL	commercial driver's license
CHEMTREC	Chemical Transportation Emergency Center
DOT	U.S. Department of Transportation
EDI	electronic data interchange
ERG2000	*2000 Emergency Response Guidebook*
FMCSA	Federal Motor Carrier Safety Administration U.S. Department of Transportation
FRA	Federal Railroad Administration U.S. Department of Transportation
GPS	global positioning system
hazmat	hazardous materials
HMR	Hazardous Materials Regulations
IMDG	International Maritime Dangerous Goods
NAS	National Academy of Sciences
NDGPS	Nationwide Differential Global Positioning System

NPRM	Notice of Proposed Rulemaking
OHMS	Office of Hazardous Material Safety Research and Special Programs Administration
OHS	Office of Homeland Security
PTC	Positive Train Control
RF	radio frequency
RFID	radio frequency identification
RMSEF	Risk Management Self-Evaluation Framework
RSPA	Research and Special Programs Administration U.S. Department of Transportation
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.N.	United Nations
UN/NA	United Nations/North America
U.S.C.	United States Code

APPENDIX B

List of Attendees
Hazardous Materials Placarding Workshop

September 24, 2002

DOT Sponsor
Frits Wybenga
Deputy Associate Administrator for HMS
U.S. DOT/RSPA

Facilitator
David L. Damm-Luhr
Acting Chief, Planning and Policy Analysis Division
U.S. DOT/RSPA/Volpe Center

Participants
Paul Bomgardner
Director of Administration
Commercial Vehicle Safety Alliance

Gary Briese
Executive Director
International Association of Fire Chiefs

Lt. Bill McDonald
Emergency Management Section
New Jersey State Police

John C. Allen
Vice President - Transportation
Battelle

Cliff Harvison
President
National Tank Truck Carriers

Robert Chipkevich
Director, Office of Railroad, Pipeline & Hazardous Materials Investigations
National Transportation Safety Board

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APPENDIX C

Hazardous Materials Placarding
Workshop Agenda

September 24, 2002

Workshop Goals: (1) To gain insight into the issues surrounding the possible removal of and alternatives to the current placarding system for hazmat shipments and (2) to identify useful next steps.

8:00 a.m. **Coffee**

8:30 a.m. **Introductions, Groundrules, and Charge to Participants**
Overview of scope of hazmat shipping, risks involved, and previous studies
What would be the impact on safety and security of removing placards from hazmat shipments?
Are viable alternatives to placards currently available and deployable?

9:00 a.m. **Role of Placards in Hazmat Shipping**
Session Objective: Gain an Understanding of the Current Placard System and Identify Potential Enhancements

- ? What information does the current placard system convey?
- ? What are the advantages of the current placard system for safety?
- ? What are the limitations of the current system?
- ? What additional information does the safety community need that placards do not convey?

Role of Placards in Security
Session Objective: Identify the Security Risks of Using Placards

- ? Does the current use of placards increase the terrorist threat to hazmat shipments?
- ? What information (besides placards) can be used to identify hazmat shipments?
- ? In what way can the current system be modified to address security concerns?
- ? Which hazardous materials pose the greatest terrorist risk?

11:30 a.m.- **Working Lunch - Purchase & Return to Meeting**

12:30 p.m. **Use of Automated Systems and Technology**
Session Objective: Identify the Functionality of Automated and Advanced Systems to Provide Additional Data

- ? What automated systems and advanced technologies are currently used to track shipments and send/receive cargo or safety-related data and information?

? How widely are they used and what are their advantages?
? Can an automated system enhance or replace the current placard system?
? What cost or implementation barriers exist?

Trade-offs between Safety and Security

Session Objective: Determine How to Balance Competing Objectives

? What are the greatest concerns about changing the current system?
? What criteria should be used to identify candidates for changes to the current placard system?
? Are there any obvious areas for improvement to the current system that would improve both safety and security?
? What are the vulnerabilities of an automated or advanced placarding system?
? What are the challenges to implementing the most promising improvements?

3:30 p.m. **Summary**

_ *Summarize findings and recommendations*
? *Identify additional information needs and analysis required*
? *Identify next steps and roles and responsibilities*

4:30 p.m. **Adjourn**

APPENDIX D

List of Attendees
Hazardous Materials Placarding Workshop

October 24, 2002

DOT Sponsor
Frits Wybenga
Deputy Associate Administrator for HMS
U.S. DOT/RSPA

Facilitator
David L. Damm-Luhr
Acting Chief, Planning and Policy Analysis Division
U.S. DOT/RSPA/Volpe Center

Participants
Paul Bomgardner
Director of Administration
Commercial Vehicle Safety Alliance

Gary Briese
Executive Director
International Association of Fire Chiefs

Lt. Bill McDonald
Emergency Management Section
New Jersey State Police

John C. Allen
Vice President - Transportation
Battelle

Cliff Harvison
President
National Tank Truck Carriers

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APPENDIX E

Hazardous Materials Placarding
Workshop Agenda

October 24, 2002

Workshop Goals: To critique and validate results of September's workshop and subsequent analysis/report (of October 22) on possible removal of and alternatives to the current placarding system for hazmat shipments.

8:00 a.m. **Coffee**

8:30 a.m. **Introductions, Groundrules, and Charge to Participants**

- *Are there factual mistakes that need to be corrected?*
- *Did you notice any faulty assumptions or beliefs about hazmat shipping, safety security or any other core concern?*
- *In what ways do any faulty assumptions or beliefs alter the conclusions?*
- *Which, if any, of the conclusions require additional support for you to consider them valid?*
- *Are we missing any information or did we fail to address any of the key questions that could strengthen the rigor of the analysis?*
- *Based on your reading of the findings and conclusions, would you modify or extend any of the recommendations?*

9:00 a.m. **Critique and Validation of Findings**

- *Previous Activity*
- *Security Concerns*
- *Current Use of Placarding*
- *Alternatives to Placards*
- *Placards and Security*
- *Other Ways to Identify Hazmat Shipments*
- *Impacts of Replacing Placards*
- *Recent DOT Activity*

11:30 a.m. **Purchase Lunch and Return to Meeting**

12:15 p.m. **Continue Critique and Validation of Findings**

3:30 p.m. **Implications for Conclusions and Recommendations**

Discuss conclusions and recommendations

4:30 p.m. **Adjourn**