APPRAISAL OF THE OPERATION RESPOND EMERGENCY INFORMATION SYSTEM (OREIS)

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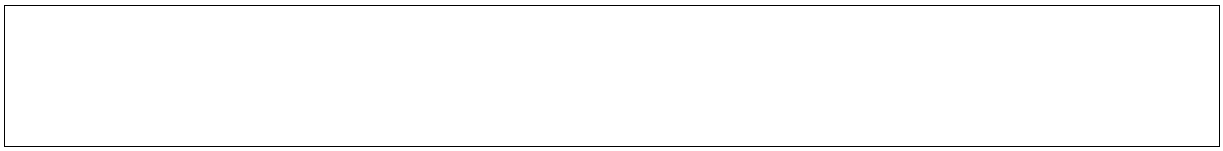
Iowa City, IA

Prepared for
Operation Respond Institute, Inc.
Washington, DC

April 1998



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EXECUTIVE SUMMARY

An emergency response information system contributes to transportation safety in general, and emergency response in particular, if it facilitates response coordination by providing reliable, accurate and timely information. Potentially, an improved information system can save community resources by reducing routine response times, unjustified evacuations, avoidable highway and track closings. The Operation Respond Institute has been instrumental in developing the Operation Respond Emergency Information System (OREIS) for first responders to hazardous material incidents in transportation. The Operation Respond system aims to facilitate rapid access to transportation carrier databases containing information on hazardous materials (HazMat) cargo. As a consequence, first responders such as police and fire department personnel are expected to respond with increased speed and accuracy at HazMat incidents or accidents.

This document reviews OREIS evaluation reports and other related studies, highlighting circumstances and events where the Operation Respond system improves emergency response to incidents involving hazardous materials transportation. In particular, OREIS evaluations include a field simulation conducted in Atlanta, Georgia, and two field simulations performed in the Buffalo Area in New York. The field tests mirror scenarios commonly found at hazardous material incidents and assess OREIS performance in conjunction with the existing DOT information system. In addition, OREIS evaluation includes first responder interviews of actual real-world use of the System. About 12 first responder interviews were conducted, nine in the greater Houston area in Texas, supplemented with responder feedback from Buffalo, NY, Nogales, Texas; and Phoenix, Arizona.

The simulations demonstrate that OREIS conveys accurate and timely information during incident response and provides added efficiencies to enhance the DOT system. Operation Respond draws on vehicle-specific HazMat content information based on the railcar or motor carrier identification number visible to the first responder. Using this linkage, a 911, fire, or police dispatcher can retrieve cargo content information and appropriate emergency response guidance within two minutes. This feature is particularly useful in situations where shipping papers or transportation carrier sources are not immediately available during a response. With the OREIS link to carrier databases, the dispatcher plays a more direct and proactive role in providing information to the first responder in the field. As part of standard response procedures and training, the first responder in the field seeks to verify product identification and related response recommendations from more than one source; therefore, any improvements in timeliness of information access are likely to facilitate incident response and responder confidence. In this regard, the simulations demonstrate that Operation Respond allows early confirmation of field observations by verifying placard descriptions and related first response recommendations.

User interviews indicate that first responders were able to incorporate the Operation Respond protocols consistently with the existing information system. Operation Respond builds on existing and familiar sources such as placard descriptions, United Nations/North American

(UN/NA) identification numbers, response guidebook, and interfaces with the CHEMical Transportation Emergency Center (CHEMTREC) and CAMEO. The responder, therefore, perceives OREIS as a useful automation of existing response protocols and procedures. Further, the training programs that were instituted to introduce OREIS among select response communities have increased awareness about HazMat emergencies and have opened a dialogue among various emergency response agencies and transportation industry participants.

In terms of transportation industry participation, user interviews indicate that while the rail industry is quite comprehensively covered by the Operation Respond program, linkages to motor carrier databases needed to be expanded. The contribution of OREIS to enhance accessibility of emergency response information during an incident would be greatly augmented from increased participation of the trucking industry.

Future evaluations of Operation Respond may include a more comprehensive survey of all OREIS deployment locations. Of particular interest in the application of OREIS is the growing use of laptop computers with a cellular phone connection and its impact on information access at the incident site. In another area, potential integration and deployment of OREIS at regional transportation management centers may be evaluated. Program evaluation should be designed and implemented to assure compatibility within the established ITS architecture and related evaluation goals, objectives, and measures.

CHAPTER 1
INTRODUCTION

OPERATION RESPOND EMERGENCY INFORMATION SYSTEM

In the Hazardous Materials Transportation Uniform Safety Act of 1990, Congress called on the National Academy of Sciences (NAS) to conduct a study on the feasibility and necessity of a central reporting system and computerized telecommunications data center capable of receiving, storing, and retrieving data concerning shipments of hazardous materials. The reporting system was to provide information to facilitate responses to accidents and incidents involving hazardous materials transport. A special report published by the Transportation Research Board (TRB 1993) discourages the implementation of a national central reporting system as described in the Act. Although the authors indicate that such a system would be too expensive and would be unlikely to function as intended, they acknowledge the need to improve information for use by emergency responders. They also recommend a limited start-up of automated information systems that would build on existing resources of the industry that handles hazardous materials transportation.

The congressional mandate and the U.S. Department of Transportation (DOT) review of the TRB report motivated the Federal Railroad Administration (FRA) and an industry consortium to create the Houston Cooperative Emergency Planning Project (Operation Respond) in November 1992. Operation Respond was a research and demonstration project designed to improve information available to first responders at hazardous material incidents.

A critical feature of Operation Respond is a computer link connecting 911 or fire and police dispatch centers to a transportation carrier database containing information about a vehicle's contents and handling instructions. Other services include the development of manuals and related protocols to develop and improve programs that would train first responders dealing with railroad and motor carrier accidents. A "Lessons Learned" report published by the Research and Special Programs Administration of the U.S. DOT (RSPA 1997), outlines the primary objectives of Operation Respond:

- communicate content information to the scene immediately using specially formed partnerships of railroads, motor carriers, and the first responder community to link 911 dispatch centers to railroad hazardous material files and motor carrier waybill files;
- provide timely and accurate content information at the scene to facilitate better communication and organization and enhance safe handling of an incident (possibly reducing injury, death, or other consequences);
- provide first responders with additional support information that might be needed during the first five to ten minutes of a hazardous material incident, including emergency response information, telephone numbers, knowledge of the roles of other first responders and transportation crews through joint training sessions specially designed to address critical first moments at the scene; and

- develop computerized passenger train equipment schematics to assist first responders dealing with passenger train accidents, whether or not hazardous materials are involved.

OBJECTIVES OF THIS REPORT

This summary report reviews past studies, field tests, and other evaluations of the Operation Respond Emergency Information System (OREIS) and highlights circumstances and events where OREIS improves emergency response to incidents that involve rail passenger rescue and hazardous materials. Components of this report include:

- a review of past OREIS-related studies and reports,
- a summary of OREIS evaluation actions and criteria,
- highlights of OREIS user interviews, and
- conclusions and recommendations.

The summary of OREIS evaluations includes results from field tests of OREIS observed in Atlanta, Georgia, and from tests in the Buffalo area in New York. Also, the summary report updates the evaluation history of Operation Respond through recent interviews with police and fire agencies in the greater Houston, Texas, area. Evaluation test results and other OREIS performance information demonstrate circumstances in which the Operation Respond system enhances hazardous material incident response.

STRUCTURE OF THIS REPORT

Review of OREIS-related studies and reports

In the initial phase of a theoretical study conducted by the Texas Transportation Institute, "Benefit-Cost Analysis of an Automated Information System for First Responders to Hazardous Material Spills in Railroad Settings," Roop and Mathur (1995) estimated potential public benefits and costs associated with the implementation of a computerized information system for first responders to hazardous material (HazMat) incidents in transportation. The study indicated that more timely and reliable information has potentially favorable economic, community, and environmental impacts, including a reduction in the level of injuries, property losses, highway closings and delays, and public evacuations. The 1995 study focuses on the nature of emergency response decision-making, information needs of the first responder, and the impact to incident response of providing timely, accurate, and reliable information. The study is discussed in greater detail in Chapter 2 of this report.

The U.S. DOT has provided financial and technical support to Operation Respond since late 1992. During the early development of the Operation Respond demonstration program, the DOT learned a number of valuable lessons. These insights and learning are shared in a "Lessons Learned" report (reviewed in Chapter 2) disseminated by the U.S. DOT, Research and Special Programs Administration (RSPA 1997).

Operation Respond field simulation

Chapter 3 summarizes simulation test results reported in a Texas Transportation Institute (TTI) study entitled *Simulation Analysis of Operation Respond in a Field Setting* (Mathur 1997). "Hard" data was generated through field test scenarios devised to evaluate Operation Respond.

Simulating the circumstances and information demands of hazardous materials response teams in transportation incidents, these scenarios mirror circumstances commonly found at hazardous material spills and measure performance, elapsed time, decision processes, and outcomes.

Actual uses of the Operation Respond system

Chapter 4 summarizes findings reported in Mathur (1997), from a limited review of "real-world" uses of OREIS in the Houston/Pasadena area in Texas. In May 1996, TTI research staff interviewed select first responders in Pasadena and Harris County in Texas. Respondents were selected based on their real-world experience with OREIS during HazMat incidents response. To update evaluations of the OREIS program, the University of Iowa Public Policy Center research staff conducted supplemental interviews with emergency response personnel in the Houston area in February 1998. Interviews gauge responders' perceptions of alternate information sources in terms of cargo content verification and related information. The goal was to assess gains resulting from the integration of OREIS with the existing system in terms of increased accuracy, reliability, and timeliness of information access during incident response. The study team also conducted telephone interviews with select emergency response personnel in Nogales and Phoenix, Arizona. In March 1998, select Buffalo area emergency response personnel responded to a questionnaire designed to obtain information based on their experiences with Operation Respond during actual HazMat incidents in transportation.

Conclusions and recommendations

Finally, Chapter 5 contains program evaluation goals, objectives, and measures, and includes overview comments and recommendations. Table 1–1 on the following page presents the structure of this evaluation.

Table 1–1. Summary report structure

Chapter 1: Introduction
Chapter 2: Review of past studies and reports • Conceptual study (Roop and Mathur 1995) • Simulation of Operation Respond in a field setting (Mathur 1997) • "Lessons Learned" report (RSPA 1997)
Chapter 3: Results of field simulations (Mathur 1997) • Atlanta railyard (March and April 1996) • Tonawanda tank trailer (June and September 1996) • Buffalo railyard (June and September 1996)
Chapter 4: Actual uses of Operation Respond deployments • Harris County, Texas, first responder interviews (May 1995 and February 1998) • Pasadena area first responder interviews (May 1995 and February 1998)
Chapter 5: Conclusions and recommendations

CHAPTER 2
REVIEW OF OREIS-RELATED STUDIES AND REPORTS

This chapter reviews earlier studies and reports related to Operation Respond. The following documents are discussed in detail.

- ***Benefit-Cost Evaluation of an Automated Information System for First Responders to Hazardous Material Spills in Railroad Settings.*** Final report submitted by the Texas Transportation Institute (Stephen S. Roop and Sondip K. Mathur), Texas A&M University System to the Houston Cooperative Emergency Planning Project, "Operation Respond," March 1995.
- ***Operation Respond: Lessons Learned.*** Research and Special Programs Administration, U.S. Department of Transportation, January 1997.
- ***Simulation Analysis of Operation Respond in a Field Setting.*** Final report submitted by the Texas Transportation Institute (Sondip K. Mathur), Texas A&M University System, to the Operation Respond Institute, Inc., January 1997.

ASSESSING AN AUTOMATED EMERGENCY RESPONSE INFORMATION SYSTEM

A Benefit-Cost Evaluation of an Automated Information System for First Responders to HazMat Spills in Railroad Settings (Roop and Mathur 1995) identifies potential public benefits of implementing a computerized information system (e.g., Operation Respond). The theoretical evaluation suggested that providing more timely and reliable information to first responders when they are responding to a hazardous materials incident can have several favorable economic, community, and environmental benefits. In particular, community resources can be conserved by reducing

- highway/track closings and delays,
- public evacuations,
- injuries, property losses, and
- cleanup and other related difficulties.

Types of HazMat emergency response decisions

Roop and Mathur (1995) classified emergency response decisions and fit empirical evidence on decision timing to a theoretical model. Decisions made by emergency response teams are classified into three general categories:

- **Decision to warn.** The first decision is whether to warn the general public. To make this decision, the response team must become aware of the danger, locate and assess the hazard, and communicate the hazard to a decision-making group who can discuss standard procedures and alternative responses to the existing hazard before deciding upon an action.
- **Protective action decision.** In response to an event, the emergency response team must decide upon appropriate protective action(s) based on a clear knowledge of what is at stake and what actions are required.

- **All-clear decision.** Emergency response teams monitor and continuously reassess the hazardous incident to determine when the danger associated with the event no longer exists.

Timing of emergency response decision-making

For any protective action to be effective, people must become aware of the potential for harm, decide to act, and take appropriate action. The literature reviewed in Roop and Mathur (1995) showed that:

- Most decisions to warn the public are made in the first 30 minutes of an incident.
- Protective action decisions are frequently incorporated in the decision to warn.
- Decisions intended to protect against exposure are arrived at more quickly than decisions that may (if made incorrectly) result in exposure. In other words, "safe-side" decisions seem to be made more quickly than decisions that might put people at risk.

Roop and Mathur emphasized that community decision-making processes at hazardous material incidents are seldom immediate and typically involve information-seeking. Decision makers are sensitive to perceptions of the risks linked to the availability of timely and reliable information during incident response. A speedier, more reliable, and more accurate information system is therefore expected to shorten decision times by eliminating or reducing situations in which

- inaction leads to passive avoidance of exposure (e.g., wait-and-see response or delay in giving all-clear signals) or
- active avoidance decisions (evacuations) are made too quickly or inappropriately.

Problems with response information

Roop and Mathur (1995) also examined the informational needs of first responders. A TRB Special Report (1993) indicates that the existing system fails with some regularity. The most common occurrence was missing information. Even when the information was available and complied with regulations, the information was often insufficient. In some instances, the carrier transport crew or driver were unable or unavailable to communicate the required information. Perhaps most significant is first responders' lack of full confidence in the existing system.

Theoretically, an automated information system improves the flow of information between transportation databases and community-based emergency response personnel. With information at the fingertips of emergency response dispatchers, those in the field responding to hazardous incidents should be able to prepare a response more quickly and accurately.

Problems getting information required by first responders

- Information (e.g., shipping papers, placards) is delayed, missing or inaccurate.
- Sources are obscured or inaccessible because of the crash, or because of fire or smoke.
- Sources do not convey enough information (e.g., placard information not descriptive enough or review of multiple shipping documents too cumbersome).
- Shipments are exempt from some federal HazMat transportation

regulations.

Problems getting information required by first responders—*continued*

- Vehicle operator is unable or unprepared to provide information.
- Responders failed to obtain or use available information (e.g., responders unaware of all information sources or unprepared to take advantage of all available information).
- Responders lack full confidence in the existing hazardous material information system.

Alleviation through automation. Roop and Mathur (1995) discuss how a computerized information protocol for emergency responders will impact the timing of decisions. The problems listed above might be alleviated with the availability of a speedier, more reliable, and more accurate information system.

- ***Required information is missing or inaccurate.*** Details about a vehicle's HazMat cargo could be called up on a computer screen in minutes with direct linkage of fire and police 911 call-in centers to rail and motor carrier databases.
- ***Placards, shipping papers, or other information sources are obscured, destroyed, or inaccessible because of a crash, fire, explosion, or toxic exposure.*** Dispatchers could use information such as railcar or motor carrier ID numbers and, through computer linkages, access transportation carrier databases containing chemical ID, placard information, chemical properties, and first response guidance. Information on various contacts along with initial first steps to prepare a response can be provided in the form of laminated cards, stick-on dashboard material, and guidance manuals installed in all police and fire vehicles.
- ***Information sources are in compliance with regulations and accessible, but fail to convey important information efficiently.*** The 911 dispatcher and first responders will be trained to read user-friendly screens of dangerous placards and other information that accompanies HazMat shipments.
- ***Information is insufficient because the material or shipment is exempt from some federal HazMat transportation regulations.*** An automated information system would determine whether a vehicle is carrying hazardous materials as identified in the transportation carrier database.
- ***Vehicle operator is unprepared to provide information.*** If the train crew is unavailable, a list of all involved vehicle numbers would allow the 911 dispatcher to access the transportation carrier database using computerized program links.
- ***Responders fail to obtain or use available information.*** Part of implementing an improved information system is to train and provide technical assistance to responders in the skills of hazard identification and information interpretation.
- ***Responders lack full confidence in the existing hazardous material information system.*** Speedier confirmation and verification of on-site observations through fire, police, and 911 dispatch accompanied by reliable and timely response guidance will promote confidence during incident response.

Potential resource savings with an improved information system

Roop and Mathur (1995) assessed potential public resource savings attributable to greater efficiency of information. Implementation of an improved information system will theoretically save community resources by reducing

- routine HazMat team response times,
- unjustified evacuations,
- avoidable highway and track closings,
- medical costs (for fatal and nonfatal injuries), and
- environmental and clean-up costs.

Emergency responders tend to follow a cautious course of action because they believe from experience that hazardous materials information can be unreliable. Lack of confidence in the accuracy of information results in longer response times. Possible consequences include injuries, unjustified traffic snarls, avoidable evacuation costs, and generally inefficient use of resources. In routine situations, an improved information system is likely to reduce HazMat team response times, resulting in the more efficient use of community resources.

Routine efficiency gains (value of HazMat team response time). Many costs of emergency response are due to routine calls. The Research and Special Programs Administration (RSPA) of the U.S. DOT considers a reportable incident to be of consequence if a hazardous material release is accompanied by one or more of the following: a fatality, reportable injury, evacuation, or major highway or track closing. Even if there are no *reportable* consequences, however, a HazMat team may still have to respond to an accident and ascertain whether hazardous materials are involved. It is this information-seeking time which, if prolonged, results in the dissipation of public resources.

Even though the costs of providing first response assistance may be covered by local property taxes, there are identifiable costs for fire and police departments if they are to respond adequately to hazardous material incidents. The inertia or slowness of information access is likely to result in higher average response costs because they degrade the efficient use of emergency response resources and increase the amount of response capacity needed. Timely and reliable access to information will reduce this cost, and increased efficiency of response services in the long-run should lead to a reduction in taxes or result in other financial benefits to the local community.

Literature provides the following cost-related estimates:

- Total public sector costs of response and preparation for all hazardous materials transportation incidents is estimated at $125 million to $250 million annually (TRB 1993).
- Direct emergency response costs (value of time of HazMat units, fire or police personnel, equipment and supplies) range from $20 to $30 per minute (Glickman et al. 1991).
- Theoretically, timely information access can reduce routine emergency response times, resulting in potential savings (of HazMat team time) ranging from $150 to $2,100 per incident (Roop and Mathur 1995).

To give an example, Houston deals with 300 to 425 spills a year that require emergency response (Saccomano 1995). Based on reductions in emergency response time and value of HazMat team time, about $315,000 to $446,250 could potentially be saved annually in the

Houston area alone. According to a TRB report (1993), between 1,000 and 1,500 rail incidents and about 10,000 to 20,000 truck incidents are reported each year. On a nationwide basis, total potential savings from routine response efficiency could amount to several million dollars.

Resource savings due to avoidable evacuations and traffic delays. A community may incur additional costs if there are evacuations and other protective actions at the site of a HazMat incident. Ineffective information at HazMat incident sites can result in unnecessary evacuations as responders assume the worst to ensure public safety. The following cost parameters are related to evacuations and traffic delays:

- A higher rate of evacuations occur in cases with informational problems.
- Twenty-five percent of consequential incidents with informational problems result in evacuation, of which 33 percent could be avoided with better information (Roop and Mathur 1995; TRB 1993).
- Average evacuation costs are $1 million per incident involving 1,000 persons at an estimated cost of $1,000 per person (TRB 1993).
- On average, traffic delays cost $500,000 per highway closing (TRB 1993).
- Using a quantitative risk assessment of the values of potential HazMat consequences, Roop and Mathur (1995) computed the following expected values:
  - unjustifiable evacuations—about $8,000 per incident and
  - accompanying avoidable highway or track closings—about $4,150 per incident.

As mentioned earlier, an emergency responder who is uncertain about the contents of hazardous cargo will act conservatively, resulting in more highway closings. What portion of these costs could be attributed to information problems, however, is not clear. Assuming that a track or highway closing is likely to accompany an unjustified evacuation, it is reasonable to include this estimate in overall gains attributable to improved availability of good information.

Other consequential costs. Other categories of costs include environmental damage and cleanup, carrier and shipper productivity losses, and other regional and social effects. Barkan et al. (1991) estimates that between 1980 and 1989, the railroad industry alone spent 100 million dollars on environmental cleanup. In addition, missing or inaccurate information could result in responders taking inappropriate or unsafe actions at hazardous material incidents, possibly resulting in greater exposure and injury to emergency response personnel and the public. It is not possible in this report, however, to conduct a risk evaluation of the costs because of a lack of data that firmly links these costs with information deficits. Increased reliability and timeliness of information, though, is likely to reduce some of these costs.

Operating costs of an automated information system. If the total potential gains are greater than the costs of implementing and maintaining an improved information system, then it is worthwhile to implement a computerized information system. Apart from the initial costs of software installation on existing (or new) communications equipment, the computerized information protocol is expected to build on existing resources. If we assume that the costs of maintaining and operating a computerized information system are minimal, the benefit-cost analysis need only assess potential savings from implementing the automated system relative to the existing information system.

LESSONS LEARNED

The U.S. DOT Research and Special Programs Administration published a report entitled *Operation Respond: Lessons Learned* in February 1997 (RSPA 1997). The purpose of the report was to help area emergency responders, transportation, public safety, and environmental officials understand Operation Respond, and to assist those who want to implement the system to improve public sector communication and emergency response. Published during the development of the Operation Respond program, the RSPA report listed the following lessons learned:

- **Build on the experiences of others.** Start your activity by forming a local steering committee comprised of all stakeholders.
- **Work together and work smart.** Once a steering committee is formed, break down barriers by forming small working groups as an effective first step toward reaching an agreement about training needs and technology requirements.
- **Don't forget the 911 dispatcher.** Rather than relying solely on information available at the scene of a hazardous material incident, first responders can get critical information through their own dispatcher. Linked to information contained in participating carriers' databases, the 911 dispatcher can provide a first responder with details about the contents of a railcar or truck, validate placards and shipping papers, and relay appropriate response guidance.
- **Train all first responders.** First responders include police, firefighters, and emergency medical services personnel. Be sure to focus on the needs of the first responder throughout Operation Respond planning and training activities.
- **Keep reaching out.** Get the word out about the importance of improving emergency response in your community. The technology that Operation Respond brings is most valuable if it becomes part of the routine emergency response procedures followed by trained, knowledgeable dispatchers and first responders.

The *Lessons Learned* report contains information about the development of Operation Respond, the program and its primary products, and some information to assist communities in deciding whether Operation Respond is right for them.

SIMULATION ANALYSIS OF OPERATION RESPOND IN A FIELD SETTING

Past studies have assessed the effectiveness of existing emergency response information systems by analyzing past incident reports, interviews with experts in the field, and case studies. This revealed that case studies seldom cite elapsed time or define a precise sequence of events. The absence of such information has created the need to deduce the chronology of typical occurrences and make some assumptions about how better information might impact incident outcomes.

Additional research and testing is driven by this paucity of "hard" data. "Simulations" (field tests) were conducted to evaluate Operation Respond in a practical setting and assess critical elements of an emergency response with and without OREIS. Elements of interest include incident notification time, arrival time of first responders, actions related to the positive identification of the railcar or truck contents, elapsed time to determine the degree of hazard posed, and basis for selection of the best course of action.

Simulation test results are presented in a Texas Transportation Institute report entitled *Simulation Analysis of Operation Respond in a Field Setting* (Mathur 1997). The empirical data presented in this report augment theoretical findings of previous research. The report's data are derived from "operational tests" of first responder activities with Operation Respond versus tests without Operation Respond. Drill scenarios were devised to simulate the circumstances and information demands of hazardous materials response teams in transportation incidents. These simulations mirror circumstances commonly found at hazardous materials spills and measure the performance of various people, elapsed time, decision processes, and outcomes.

SUMMARY

Chapter 2 links study results to demonstrate the potential contribution of Operation Respond toward improving emergency response and transportation safety. More accurate and complete information can lead to more timely responses which translates into a more efficient and productive use of resources and increases confidence among first responders at a HazMat scene. Communities may be able to employ fewer resources, improve responder productivity, or make decisions that are less costly.

CHAPTER 3
OPERATION RESPOND FIELD SIMULATION RESULTS

INTRODUCTION

This chapter summarizes results from *Simulation Analysis of Operation Respond in a Field Setting,* a final report submitted by the Texas Transportation Institute (Sondip K. Mathur) to the Operation Respond Institute, Inc., in January 1997. It also presents the results of field tests that used HazMat and first responder teams consisting of police and fire department personnel in the cities of Atlanta, Georgia, and in Buffalo, Cheektowaga, and Tonawanda in New York. Participating rail and motor carriers were the Norfolk Southern Rail company in Atlanta, and Conrail and Chemical Leaman in the Buffalo area.

SIMULATION OBJECTIVES

The purpose of the tests was to gather the data necessary to determine the incremental benefits to the first responder community through the use of the Operation Respond system. Evaluation of OREIS is based on several factors:

- reliability of cargo identification of OREIS in conjunction with existing systems,
- speed of identification,
- integration with existing information systems and response protocols,
- effectiveness in providing useful commodity information, and
- responder reactions (willingness to use the system, training requirements, and effect on responder decisions).

FIELD SIMULATIONS

The field simulations alternated between “use” and “no use” of OREIS along with existing DOT standard procedures in select target communities in the Atlanta and Buffalo areas. A single simulation consisted of two field tests: a pre-OREIS test and a post-OREIS test. The pre-OREIS test observed a first responder team that has access to the existing DOT system components but not OREIS. The post-OREIS test observed a HazMat team that has been trained in the use of OREIS and included Operation Respond protocols with the existing DOT system.

The Operation Respond system was introduced in field tests that simulated a certain degree of hazard and then first response events and actions were recorded. The existing DOT emergency response information system was the baseline for assessing incremental gains from using OREIS protocols.

The test results compare first responder activities with Operation Respond versus first responder activities without Operation Respond. The parameters of interest were the “information seeking” activities of the first responder. Critical events included the first responders’ ability to read vehicle markings and placard descriptions, and their use of such

information with other DOT information system components both with and without OREIS. In both the with- and without-OREIS drills, beyond the feigned alarm, the field tests were allowed to unfold independent of any simulation controls.

SIMULATION 1: ATLANTA RAILROAD YARD INCIDENT

Time and location of tests

Test	Date	Begin time	End time	Location (both tests)
pre-OREIS	3/4/96	3:00 pm	4:00 pm	Norfolk Southern Railway Yard Fortress Street Atlanta, Georgia
post-OREIS	4/4/96	2:00 pm	2:40 pm	

Field design

- Atlanta Deputy Fire Chief, posing as a "bystander," notifies the Atlanta Fire Department Communications Center that an "odor was reported" at a railyard.
- Hazardous material product is unknown at the time of initial report.
- Shipping papers and rail company database show tank car to contain chromium trioxide anhydrous, division 5.1.
- Fire Communications Center dispatches HazMat squad to incident site.
- Yard office is closed (simulated) during incident response.
- HazMat team is directed toward the designated tank car that simulated a release in the form of wetness around its dome.

Simulation performance

The fire communications center dispatched a HazMat team to "check-out unidentified odor" at the railyard. At the scene, the HazMat team was directed toward the designated tank car that simulated a release in the form of wetness around the tank car's dome. While remaining at a safe distance from the release, the HazMat crew used binoculars to survey the incident site. Keeping radio contact with the incident commander, the survey team looked for markings, labels, and placards on the tank car.

The first response crew was able to read the placard and, based on the UN number and placard description, surmised that they were "dealing with an oxidizer" under HazMat division 5.1. During the course of the response, the incident commander collected information on weather conditions and topological features around the leaking tank car.

In the pre-OREIS test, the HazMat team used the North American Emergency Response Guidebook (NAERG) and an in-vehicle information software package called CAMEO to obtain material identity information and response recommendations. Based on the tank car's emergency response guidebook (ERG) guidance, the incident commander made a "full HazMat assignment" and set up a "zone of protection." As the incident response progressed, the incident commander called for a "second alarm" and decided to evacuate the area within a 500-foot radius. The incident commander made protective action decisions within nine minutes of the tank car's placard reading.

In the post-OREIS test, Operation Respond performed in a timely manner. First response recommendations were relayed by the dispatcher within two minutes of the incident commander's request, and altogether within four minutes of the on-site placard reading.

In both tests, access to shipping papers was delayed. A railroad company official arrived on the scene and provided the incident commander with relevant shipping papers. The simulation was stopped when the incident commander indicated he had confirmation and verification of the identity of the chemical and its related properties.

Discussion

Basis for chemical identification. There are two primary sources bases for chemical identification of a shipment:

- ***Placard/UN identification number.*** Used in conjunction with chemical listings from the *Emergency Response Guidebook* or other information sources such as *CAMEO*, the UN identification number does not always point to a unique chemical identity. For example, UN ID 2927, Guide no. 154, corresponds to eight materials listed in the Emergency Response Guidebook (ERG) and does not point to a vehicle-specific chemical identity.
- ***Railcar number.*** Used with shipping papers or transportation carrier databases/sources, the railcar number provides vehicle-specific chemical ID.

Value added with OREIS

- Pre-OREIS test: because shipping papers were not immediately available, the HazMat team was unable to use the railcar number as a source of information on the contents of the car.
- Post-OREIS test: railcar number became critical as the incident commander was aware that the dispatcher could use OREIS to access vehicle-specific information from the rail company's waybill database; within minutes of the railcar number being relayed from the incident site, the dispatcher used OREIS to respond with chemical identification and confirmation of the on-site placard description.

Verification of field observations. First responders are trained to confirm and substantiate on-site vehicle HazMat markings with alternate sources. The simulation demonstrates two findings:

- First responders at HazMat incidents approach potential incidents with caution.
- First responders maintain some doubt about the reliability and accuracy of conventional sources of information. First responders need to confirm or verify information with more than one source.

Value added with OREIS

- Early confirmation of the first responder's field observations (vehicle placard, UN number) is likely to increase confidence during response.
- Early verification of information minimizes the impact of any delays in obtaining shipping papers or contacting company sources.

First response decisions. Timeliness of product identification and accuracy of response recommendations impact the quality of emergency response decision-making. Response decisions can be based on indirect product identification sources (e.g., ERG and placard descriptions) and vehicle-specific product identification and response recommendations (e.g., shipping papers, MSDS, and Waybill data).

Value added with OREIS

- Pre-OREIS test: first responder decisions were based on ERG and CAMEO information, as the shipping papers were not immediately accessible.
- Post-OREIS test: OREIS provided direct access to waybill data within minutes.

Role of dispatcher and first responder training. The first responder obtains information from local community sources (e.g., local dispatch center or on-site observations) and distant sources (e.g., contacting disparate agencies and entities).

Value added with OREIS

- OREIS has transformed the role of the dispatcher from serving as a liaison between outside agencies to performing as a more immediate information source.
- The dispatcher's position has become strategic to OREIS as he or she can provide material ID and protective action recommendations.

SIMULATION 2: TONAWANDA TANK TRAILER OPERATIONAL TESTS

Time and location of tests

Test	Date	Begin time	End time	Location (both tests)
pre-OREIS	6/28/96	9:00 am	9:40 am	Chemical Leaman Yard 470 Fillmore Avenue Tonawanda, New York
post-OREIS	9/13/96	9:00 am	9:25 am	

Field design

- Police officer on regular patrol calls 911 and reports a puddle of liquid under a trailer.
- Dispatcher alerts fire department advising that leak may be hazardous material.
- Hazardous material product unknown at the time of initial report.
- Shipping papers and motor carrier show that the tank trailer contains toluene diisocyanate.
- City and Town of Tonawanda dispatch two companies from the City of Tonawanda and Town of Tonawanda (Brighton).
- There is a unified command structure between the City and Town of Tonawanda (Brighton).

Simulation performance

In the pre-OREIS test, a police patrol officer reported the incident, left the motor yard and parked in the street in front of the yard entrance. An on-the-scene fire department incident commander sent a firefighter to the Chemical Leaman yard office to obtain relevant shipping papers. At this time, the incident commander also requested a motor carrier official to join the response team. The motor carrier official assisted in the review of the shipping papers and the Materials and Safety Data Sheet provided by the yard office. The incident commander matched and verified the tank trailer's hazardous cargo with descriptions in the NAERG. Following the review of shipping documents, two firefighters entered the yard wearing protective turnout clothing and self-contained breathing apparatus (SCBA), located the leaking trailer, and verified its UN number. The entry team, however, could not find shipping papers in the vehicle. The incident commander contacted CHEMTREC to confirm chemical properties and related first response recommendations. The simulation was concluded when the incident commander expressed confidence in the accuracy of the information. The incident commander accessed information sources in the following sequence: shipping papers/company official, NAERG, placards and vehicle markings, and CHEMTREC.

In the post-OREIS test, the reporting police officer parked upwind, and using binoculars read the vehicle's UN number and tank trailer identification number. The police officer reported this information to the 911 dispatcher. The dispatcher, based on the police officer's report, used OREIS to obtain information related to the tank trailer's product. The dispatcher relayed the product identity, related chemical properties and response recommendations to the first responders en route to the incident site.

The responding fire department parked near the police vehicle and established an incident command system. The incident commander sent one firefighter to the suspect vehicle to retrieve shipping papers. Meanwhile, the incident commander requested the dispatcher send a printed copy of the OREIS information.

Upon obtaining shipping papers and verification using a printed copy of the OREIS output, the incident commander sent two firefighters wearing protective clothing and special breathing apparatus to check the extent of the leak and verify the trailer's UN number at a closer range. The simulation concluded when the incident commander expressed confidence in the quality of the information regarding the chemical properties of the material as well as appropriate first response actions.

Discussion

Basis for chemical identification. The simulation demonstrated that in order to obtain material ID and response guidance, the exhibits two tendencies: (1) to rely first on the most direct, precise and locally available sources of information and to contact outside sources as the team works to resolve the incident and (2) to seek assistance in the review of HazMat documentation (e.g., shipping papers and MSDS information).

Value added with OREIS

- In the post- test, the dispatcher (a local and familiar information source) used OREIS with police patrol's initial report to provide chemical ID and first response guidance.
- OREIS allowed the first responder to get vehicle-specific information in an organized and user-friendly format, providing relief from going through disparate paper sources (OREIS printout was sent via patrol car to on-site commander).
- OREIS served as a valuable source to corroborate carrier placard/ERG descriptions, satisfying the need to verify information through more than one source.

First Responder training and awareness. First responders are the people first on the scene of an incident and include carrier crews, firefighters, police, and emergency response personnel. The simulation demonstrated that:

- often a police officer on routine patrol is the first responder at a HazMat incident, and
- training and awareness of first responders can have a measurable impact on incident response.

Value added with OREIS

- Pre-OREIS test: The police officer reported the incident, but did not play a very active role in the incident response.
- Post-test: The reporting police officer had OREIS and Hazardous Material Awareness Training (HMAT). The officer sounded the alarm and undertook a visual inspection of the tank trailer, its placard and identifying markings. The officer then relayed this information to the 911 dispatcher.
- The dispatcher used OREIS (and vehicle number) to obtain product identity, chemical properties, and first response recommendations within minutes of the first alarm.
- The dispatcher relayed this information to the fire department response team while it was on its way to the incident site, allowing a more informed HazMat team to arrive on the scene.

SIMULATION 3: BUFFALO/CHEEKTOWAGA RAILYARD OPERATIONAL TESTS

Time and location of tests

Test	Date	Begin time	End time	Location (both tests)
pre-OREIS post-OREIS	6/29/96 9/13/96	10:00 am 1:20 pm	11:05 am 2:05 pm	Conrail Frontier Yard Harlem Road/Walden Avenue Buffalo/Cheektowaga, New York

Field design

- A rail yard tank car is leaking in a fully operational yard; management and employees are on duty in a 24-hour environment.

- Car Department Inspector during routine inspection smells pungent odor, evacuates area, and informs Frontier Control Tower of the problem. Frontier Control Tower calls Emergency 911 and information is relayed to the dispatch center.
- Hazardous material product is unknown at the time of initial report.
- Shipping papers and motor carrier database show tank trailer contains chlorine.
- Frontier yard is split between the City of Buffalo and the Town of Cheektowaga and therefore becomes a “Joint Operation Alarm” between the City and Town.

Simulation performance

In both the pre- and post-OREIS test, a radio report from a car inspector working in the rail yard indicated the presence of a pungent, suffocating odor. The inspector evacuated the area and notified his supervisor at Frontier Control. Upon notification, the train master called 911 to report the incident. The 911 dispatcher notified Buffalo Fire Dispatch, which alerted the Cheektowaga Police/Fire Dispatch. At the Conrail Yard Entrance, a “combined incident command system” was set up. A Conrail train master joined the incident response command system with location information but provided no product-related details. The incident command team sent two firefighters in protective clothing with special breathing apparatus to locate the tank car in question and relay the car number and UN number.

In the pre-OREIS test, the entry team reported back to incident command information on the tank car number and a stencil marking indicating chlorine. The incident command started gathering information using the NAERG. The rail company provided related information from the waybill file and sent a printed copy of the information about the product and related Material Safety Data Sheet. After final verification by tank car number and UN number in the NAERG, the simulation was called to an end.

In the post-OREIS test, the entry team, using binoculars, read the tank car number but could not identify the vehicle’s placard or UN number. The entry team’s view was limited by the tank car’s position and the presence of a box car in front. The entry team had to leave the area because of low air levels in the SCBAs. Both dispatch centers using the OREIS computer system retrieved information using the railcar number. OREIS accessed the rail company’s waybill file and an OREIS-output hard copy was sent to the Incident Command team from the Cheektowaga dispatch by police car. Another copy was sent out by fax to the Division Chief’s vehicle from Buffalo Fire Dispatch. In addition, the railroad sent the shipping papers and a Materials Safety Data Sheet to the incident command. After verification of paperwork, the incident commander was satisfied with the accuracy of the information and the simulation was concluded.

Discussion

Basis for product identification. Before any product identification can be undertaken, the first responder has to visually survey placard descriptions, UN identification numbers, and other markings. This on-site incident survey is impacted by the location and position of the suspect vehicle or tank car. Therefore, it may be inconvenient for the survey team to read a placard or other HazMat markings, and it may be convenient for the survey team to read railcar numbers that are prominently displayed on all four sides of the vehicles.

Value added with OREIS

- Pre-test: the incident command relayed car markings (railcar number, chlorine stencil) to the fire dispatcher; rail yard tower responded with product identity and car number confirmation, and dispatched related papers to the incident scene.
- Post-test: the incident commander relayed the railcar number to the fire dispatcher who used OREIS to respond with information on product identity, placard description, car number confirmation, and related response recommendations.

Timeliness, accuracy, and verification. The Buffalo railyard simulation was in fairly ideal conditions. As part of the field settings, the first responder had access to adequate resources due to proximity to a metropolitan area (Buffalo/Cheektowaga). Also, the railyard was situated close to a yard tower with employees and management functioning in a 24-hour environment.

Value added with OREIS

- Given the convenience of an easily accessible yard tower and other resources available to the first responder, the existing emergency response system performed in a timely and accurate manner.
- The Operation Respond system's performance was comparable, which indicates the value OREIS can impart when incident conditions are not ideal and the emergency response has to be undertaken in more isolated situations.

CONCLUSION

The simulations looked at direct sources of information (shipping papers and transportation carrier databases), indirect sources of information (placards and guidebook information), basis for information search (railcar/vehicle ID versus placard description and UN/NA number) and first responder decisions (taken before or after positive chemical identification).

The simulations demonstrate that OREIS can convey accurate and timely information to a first responder at an incident scene and can provide added efficiencies to enhance the DOT's system. Operation Respond draws on vehicle-specific HazMat content information and, once in place, all that is needed to activate the system is the railcar/motor carrier identification number visible to the first responder. Using this linkage, a 911 dispatcher can receive specific cargo content information and appropriate emergency response guidance within a few minutes.

CHAPTER 4
ACTUAL USES OF THE OPERATION RESPOND EMERGENCY INFORMATION SYSTEM

INTRODUCTION

A Texas Transportation Institute study (Mathur 1997) presented results of first responder interviews related to actual uses of OREIS in the Houston area in Texas. These interviews were conducted in May 1996 and focused on gauging first responder perception of the effectiveness of alternate emergency response information sources in terms of cargo content verification and related information accessibility.

A total of four respondents were interviewed: two from the Harris County Sheriff's Department and two from the Pasadena Police Department in Texas. Respondents were selected based on their experience in the actual uses of OREIS during hazardous material incident response and based their reflections on their experiences over a 5-month period (during which the Operation Respond system was put to use in about eight incident response instances).

In February 1998, the University of Iowa Public Policy Center research staff undertook supplemental interviews in Harris County and Pasadena (both in Texas). Five emergency response personnel were interviewed from Pasadena and Harris County police and fire departments. In addition, two telephone interviews were conducted, one with staff at the Emergency Response Commission in Phoenix, Arizona, and another in the Laredo Fire Department in Texas. The objective was to record user perceptions of the existing system and Operation Respond and to capture any shift in user perceptions over time. With the passage of time, consistency of user perception would demonstrate OREIS performance reliability.

The format of these supplemental interviews was compatible with those conducted in May 1996. Past and recent interview questions were designed to collect information about responder experiences with incidents or accidents involving hazardous material by rail or motor carriers. Questions attempt to capture first responder perceptions of the various emergency response information system components available to the first responder. The answers are expected to provide data that will help evaluate information sources available to the first responder, and Operation Respond system performance in particular. This will indicate the value, if any, in integrating Operation Respond with standard response protocols.

RESPONDER INTERVIEWS

Mathur (1997) reported findings in which respondents rated the usefulness of alternate sources of information and accessibility and reliability during an incident response. Respondents were asked to rate the emergency response information sources using a six-point scale ranging from excellent (1) to very poor (6). Additional discussion focused on the performance and use of components of OREIS during actual incident responses.

Effectiveness of information sources in providing chemical ID and material properties

Mathur (1997) listed the following information sources: (1) shipping papers (rail/motor), (2) rail/motor crew; (3) placards, (4) car ID number, (5) UN ID number, (6) NAERG, (7) CHEMTREC, (8) rail company, (9) motor carrier, (10) OREIS, and (11) other. Table 4.1 averages respondent ratings regarding the information content effectiveness of various emergency response information system components during an incident response. By averaging the responses, we can compare across the two rounds of interviews.

Table 4–1. Information effectiveness obtaining material identity and properties (average ratings)

Information source	Material identity	Material properties
1. Shipping papers (rail/motor)	*good–very good*	*good*
2. Rail/motor crew	*fair–good*	*fair–good*
3. Placards	*fair*	*poor–fair*
4. Railcar ID number	*good*	*fair*
5. UN ID number	*fair*	*fair*
6. NAERG	*fair*	*good*
7. CHEMTREC	*good*	*good–very good*
8. Rail company	*fair–good*	*good*
9. Motor carrier	*good*	*good*
10. OREIS	*good–very good*	*good–very good*

Respondents observed that the most frequently used components of OREIS during incident response included accessing information related to railcar numbers, placard descriptions, UN number listings, and the OREIS phone directory. The respondents felt that OREIS provides both chemical ID and related response information, while other sources may only provide one or the other. Although shipping papers are still a primary source for confirmation and verification, it was felt that they may be “hard to understand.”

According to the supplemental interviews conducted in February 1998, use of OREIS seems to have integrated well with existing response procedures and protocols over time. The Harris County Sheriff’s department has mandated use of OREIS on a regular basis, and it has become part of the standard emergency response procedures and protocols to be followed. OREIS continues to be rated highly for speedy chemical ID and related response information. First responders indicate that OREIS brings credibility into the chemical ID “verification process” during response.

Respondents cited additional circumstances in which OREIS is expected to add value:

- the UN/NA number does not provide unique chemical identification (e.g., gasoline and alcohol are assigned the same number);
- mixed loads are involved;
- additional information is required (tank or passenger car schematics for search and rescue operations); or

- incident occurs along international borders (nonstandard chemical names, shipping paper noncompliance).

In a telephone conversation, a firefighter in Laredo indicated additional circumstances in which the use of OREIS may prove beneficial. He stated that, at times, chemicals coming across the border from Mexico were marked differently, and he hoped that Operation Respond would lead the effort to standardize information (especially if more truck companies participate in the Operation Respond program). Other causes of information bottlenecks at the border are language problems and instances where a custom's agent instead of the truck driver carries the shipping papers with the chemical ID. It has been suggested that as more trucking companies begin participating in the Operation Respond program, OREIS will become a potent first response information source.

Perception of accessibility and reliability of information source

Table 4–2 presents respondents' ratings of accessibility and reliability of information sources during emergency incident management. Once again, the respondents used the same six-point rating scale.

Table 4–2. Perceived accessibility and reliability ratings of information sources

Information source	Accessibility rating	Reliability rating
1. Shipping papers	*fair*	*good*
2. Rail/motor crew	*fair*	*fair*
3. Placards	*fair*	*fair*
4. Railcar ID number	*very good*	*good*
5. UN ID number	*fair–good*	*fair*
6. NAERG	*good*	*fair*
7. CHEMTREC	*good–very good*	*good–very good*
8. Rail company	*good*	*good–very good*
9. Motor carrier	*good–very good*	*good–very good*
10. OREIS	*very good*	*very good*

The perception of smoother and more efficient information access with OREIS can be attributed to the "automation" added to the information management process. Since communicating with the local police/fire 911 dispatcher is routine, the first responder feels comfortable receiving incident management information from the dispatcher using OREIS, and thereby the first responder avoids the need to call several phone contacts in the early stages of an emergency response. All respondents, however, felt strongly that access to rail companies was fairly streamlined and that having a link to motor carrier databases would be extremely valuable.

In supplemental interviews conducted in February 1998, first responders reiterated the following routine situations in which availability of OREIS impacts incident response:

- shipping papers are not immediately available;
- there are delays in contacting transportation carrier personnel;

- placards are vandalized or are not visible following a crash;
- timely information could keep incident response from going to “higher levels of hazmat” and could conserve resources; and
- additional sources for confirmation and verification are needed (necessary redundancy).

Respondents felt that OREIS provides timely, reliable, and accurate information mainly because of its ability to access carrier databases using motor or railcar numbers. Several respondents felt that in terms of motor carrier transportation, large trucking companies are “good” about HazMat regulation compliance and placarding, whereas independent truckers are relatively lax. It is therefore suggested that OREIS will impart significant value if the participation of “independent” truckers in the Operation Respond program is expanded.

First responder training and awareness

Police and fire. Some respondents felt there was a need for greater awareness of the use of first response information sources and OREIS among the first responder community. One respondent cited an instance when the police, the first to arrive at the suspected HazMat incident site, began immediate area evacuation. Meanwhile, the fire department used OREIS to identify the product as corn oil and prevented the response from going to a higher level. Some respondents observed that OREIS has prompted a greater awareness among police personnel about HazMat first response and has increased coordination between the police and fire departments. They are appreciative of the training that some police personnel have gone through as a result of the OREIS capability becoming part of their communications dispatch center protocols. It was observed that there is now greater understanding among police personnel about the work that firemen undertake during chemical emergencies.

Some interview respondents indicated that the police department now sees their role as going beyond “law enforcement” to include chemical emergency response support. The respondents noted that there were incidents when the OREIS protocol was initiated while fire department personnel were en route to the incident site. With greater awareness and better training of police personnel, they expect to be more proactive and provide better support to fire departments during incident response.

Dispatcher. Respondents also observed that the role of the communications “dispatcher” has changed with availability of the OREIS. The dispatcher can now play a more dynamic role. The police or fire department dispatcher’s position has become more strategic as the OREIS protocols allow him or her not only to identify hazardous material cargo and its characteristics, but also to provide the first responder with protective action recommendations. The role of the dispatcher has changed from that of an intermediary between the first responder at the incident site and some outside information source to the role of “information source” itself. In recent interviews, respondents indicated that the training schedules must be more frequent to account for a high rate of turnover at dispatcher positions.

Training tool. Recent interviews indicated that OREIS is increasingly being used as a “training tool” to conduct simulations and review placard descriptions, the use of UN/NA numbers, and how to access tank cars and rail passenger car schematics for potential search and rescue operations.

Performance and use of components of OREIS during a transportation incident

In response to additional questions, respondents felt the incorporation of OREIS with standard first response protocols positively impacted incidence response. In this regard, it was perceived that first response information-seeking was an improvement because it allowed coordination with the fire or police department dispatcher. Respondents appreciated having computerized access to information which would otherwise only be available from disparate “paper” sources such as shipping papers and the NAERG. Respondents suggested, however, that they would continue to use other information sources along with OREIS. They indicated that if any incidents were to occur at an odd time or location, OREIS would be likely to favorably impact first response decisions. They also observed that they would “rather be with than without” the OREIS protocol and would prefer to avoid having to “sit on the street and wait it out till they get confirmation” of first response information.

CONCLUSION

The purpose of the interviews was to qualitatively rate various sources of information available to the first responder in terms of effectiveness, reliability, and accessibility. In addition, the interviews provide information on the circumstances in which OREIS impacts emergency response information management. The responder interviews, while limited in number, provide a flavor of the qualitative benefits associated with automation of information access. This review of actual use of OREIS can be expanded to survey all OREIS deployments to allow greater diversity in feedback as well as to obtain statistically significant findings.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

This summary report reviews past studies, field tests, and other evaluations of the Operation Respond Emergency Information System, focusing on circumstances and events where OREIS improves hazardous material emergency response or rail passenger rescue. In conclusion, this chapter discusses evaluation criteria that will indicate that Operation Respond increases transportation safety, and improves hazardous material incident response in particular.

COMPONENTS OF VALUE ADDED

An emergency response information system, or any of its components, substantiates the hypothesis that it adds value to improving transportation safety in general, and to emergency response in particular, if it contributes to the

- timeliness of information availability during response,
- reliability of the first response information search process,
- accuracy of information that becomes available during response, and
- facilitation of emergency response coordination.

TEST MEASURES

Test measures are quantifiable or measurable parameters that attempt to validate the intended impacts or physical functions required of the object to be deployed and used in a realistic environment. Each value added component can be linked to select evaluation measures. The following are select parameters relevant to assessing value added from integrating OREIS with current emergency response protocols:

- Timeliness of information availability during response (change in elapsed time for various phases of a HazMat incident response)
- Reliability of the first response information search process
  - first responder perception (rating) of reliability of information source
  - potential to reduce the number of incidents with excessive response times
- Accuracy of information that becomes available during response
  - first responder perception of accuracy of information available through OREIS
  - first responder perception of OREIS effectiveness to obtain positive ID and chemical properties, and first response recommendations
- Facilitation of emergency response coordination
  - first responder perception of the accessibility of OREIS during incident response
  - first responder perception of OREIS effectiveness to obtain positive ID and chemical properties; first response recommendations

- first responder perception of operational compatibility with on-scene operations and existing command and control procedures
- first responder perception of impact on number of agencies contacted to resolve incident response decision-making

These select measures can form the basis for validating the hypothesis that OREIS adds value to transportation safety in general, and to the HazMat incident response process in particular.

MEASUREMENT OF VALUE ADDED

As the review in previous chapters indicates, the data necessary to determine the value realized by the first responder community through the use of OREIS has been obtained through:

- simulations of typical occurrences (field drills) and
- first responder interviews reviewing actual real-world use.

Field simulations and user surveys provide information on how value-added components were impacted during incident response

- before OREIS was available to first responders (pre-OREIS) and
- after OREIS was available to first responders (post-OREIS).

Data obtained from the on-site simulations and actual use reviews measure effectiveness, performance, and suitability of OREIS in conjunction with standard DOT information sources.

SIMULATION OVERVIEW

Chemical identification

The various pre-OREIS and post-OREIS tests demonstrated that first responders were able to incorporate Operation Respond protocols consistently with components of the existing information system. A subtle, but important aspect that is apparent with the introduction of OREIS is that the railcar or motor carrier number has become a potent and viable basis for obtaining product information. With an immediate lack of access to shipping papers or transportation carrier officials, the railcar or motor carrier number is less relevant, and the first responder has to wait for confirmation and verification of field observations. Operation Respond, however, allows early confirmation of field observations by verifying placards descriptions, railcar or motor carrier markings, and related first response recommendations by accessing transportation carrier databases.

First responder training

The simulations indicate a significant positive spillover related to the introduction of OREIS in first responder communities is the result of the provision of training and HazMat awareness. The Operation Respond Institute has been responsible for training and deploying OREIS among the target first responder communities. Training programs that were instituted to introduce OREIS among first responders seem to have impacted the communities' response capabilities more directly. Pre- and post-OREIS field test comparisons therefore have to be qualified to take this into account. Increased awareness and training has left its mark in the wake of the introduction of OREIS among first responder communities.

Role of the dispatcher

The field tests and first responder interviews indicate the changed role of the 911, police, or fire dispatcher during an incident response. The dispatcher can now play a more direct and proactive role in providing information to the first responder in the field. The dispatcher should routinely provide OREIS output/printout to the first responder not based solely on a search by UN number, but also by railcar or motor carrier number. In the event that the responder does not request all the information available from the dispatcher, OREIS should prompt the dispatcher to be forthcoming with additional information.

INTEGRATION OF OREIS WITH THE EXISTING SYSTEM

Simulation data and first responder interviews provide information on the qualitative value of OREIS applications. In particular, the interviews in Pasadena and Harris County, Texas, suggest that responders have been able to integrate OREIS fairly well. The following factors account for the ease with which OREIS was integrated into standard response protocols.

- OREIS builds on existing and familiar resources.
  - OREIS relies on existing information system components (placard descriptions, UN ID number, railcar or motor carrier number, interface with other familiar sources such as CHEMTREC, CAMEO, NAERG information, and emergency phone listings). First responders think of OREIS as an automated innovation of the existing system.
  - OREIS allows first responders to obtain critical information from local sources (police/fire/911 communications dispatchers).
- OREIS includes additional features such as the schematics of AMTRAK and tank car types, customized local emergency response contact list, and user-friendly access to chemical names and related information.

RECOMMENDATIONS

Expand the participation of motor carriers in OREIS

Interviews with first responders indicate that the contribution of OREIS toward streamlining emergency response information during an incident would be greatly enhanced if both large and small independent trucking companies were to participate. Background information on the share of HazMat transportation attributable to large and small trucking companies would shed light on the extent of the OREIS outreach program requirements and the potential of OREIS to impact HazMat transportation by road.

Future evaluations

User interviews can be expanded to a more comprehensive survey of all OREIS deployment locations. This expanded survey will capture diversity in user experiences and perceptions and provide statistically robust findings. In addition, OREIS field simulation could include rural settings and locations other than motor or rail yards. In another area, potential integration and deployment of OREIS at regional transportation management centers may be evaluated. Program evaluation should be designed and implemented to assure compatibility within the established ITS architecture and related program evaluation goals, objectives, and measures.

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APPENDIX A
OPERATION RESPOND EMERGENCY INFORMATION SYSTEM (OREIS) USER QUESTIONNAIRE

INSTRUCTIONS: You have observed use of the both existing U.S. DOT information system (placards, shipping papers, other sources) and the Operation Respond Emergency Information System (OREIS) during incident response. This questionnaire is designed to collect information about your experiences with incidents or accidents involving hazardous material by rail or motor carriers. If the space provided for any item is inadequate, please attach extra sheets. Additional copies in this format may be reproduced and used.

RESPONDENT'S BACKGROUND

1. Please indicate your age group:

❑ under 21
❑ 21–30
❑ 31–30
❑ 41–50
❑ 51–64
❑ 65 or over

2. Please indicate your occupation/employer:

❑ Police department
❑ Paid fire department
❑ Paid ambulance/rescue squad
❑ Volunteer ambulance/rescue quad
❑ Other safety agency: _____
❑ Special HazMat response team

3. What is your position within this organization?

_____

4. How long have you been in your present occupation?

❑ Less than 1 year
❑ 3–5 years
❑ 6–10 years
❑ 11–20 years
❑ More than 20 years

5. How long have you been involved in hazardous materials transportation?

❑ N/A
❑ Less than 1 year
❑ 3–5 years
❑ 6–10 years
❑ 11–20 years
❑ More than 20 years

6. How many incidents involving hazardous materials transportation have you responded to:

_____ In your career?
_____ In the last 3 years?

❑ N/A

7. Please indicate your current level of hazardous materials training (check all that apply):

❑ None
❑ Basic recognition (2 hrs/yr)

PART 1: On-site record of an actual HazMat incident/accident in transportation

Part I of this questionnaire focuses on information related to actual HazMat transportation incidents. Please include any anecdotal information about events and actions relevant to a specific incident/accident where the Operation Respond Emergency Information System (OREIS) has been used along with existing U.S. DOT information systems components.

8. Please complete on all incidents

a) Fire/police department name: _____
b) Date: _____
c) Alarm time: _____
d) Method of alarm from public/other: _____
e) Initial action/response: _____
_____
f) Incident address: _____
_____
g) Arrival time at incident site: _____
h) Type of transportation involved (rail/motor/other): _____

9. Incident description

a) Time incident assessment/information-seeking commenced: _____
_____
b) Type of situation found: _____
_____
c) Description of spill/leak: _____
_____
d) Visual and other assessment: _____
_____

10. Highlights of first response actions, initiatives and related events

(Please include, to the extent possible, the timing of initiatives and related events leading to positive identification of the chemical.)

Action and events	Time
a) First response and information seeking actions	

b) Positive identification of chemical	

Action and events	Time
c) Determination of the degree of hazard	
d) Determination of best course(s) of action	

PART 2: Review of incident response

This section attempts to capture first responder perceptions of various components of the emergency response information system available to the first responder. Our main objective is to get feedback on the performance of various emergency response information sources available to the first responder during an incident response. Your answers will provide us with valuable data that will help to evaluate information sources available to the first responder and the value of integrating Operation Respond (OREIS). Responses to questions can pertain to the specific incident described in Part I or the responses may be based on your general perception and experience with incidents or accidents involving hazardous materials in transportation.

11. Please check information sources used during emergency response

Component	Source used?	Impact on response
a) Shipping papers	❑ yes ❑ no	
b) Vehicle crew	❑ yes ❑ no	
c) Railcar/motor carrier ID	❑ yes ❑ no	
d) Placard	❑ yes ❑ no	
e) UN ID number	❑ yes ❑ no	
f) NAERG (response guidebook)	❑ yes ❑ no	
g) Company officials	❑ yes ❑ no	
h) AAR list	❑ yes ❑ no	
i) Phone directory	❑ yes ❑ no	
j) CHEMTREC	❑ yes ❑ no	
k) OREIS link to carrier database	❑ yes ❑ no	
l) OREIS features (e.g., tank car, AMTRAK schematics, other features)	❑ yes ❑ no	
m) Other (specify)	❑ yes ❑ no	

12. Please circle a number from 1 to 6 to rate each information source used in terms of
- **accessibility and reliability during incident response and**
- **effectiveness in providing product ID and chemical properties.**

1 = Excellent
2 = Very good
3 = Good
4 = Fair
5 = Poor
6 = Very poor

Information source	Source *accessibility*	Source *reliability*	Obtaining *product ID*	Obtaining *properties*
a) Shipping papers	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
b) Vehicle crew	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
c) Railcar/motor carrier ID	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
d) Placard	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
e) UN ID number	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
f) NAERG (response guidebook)	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
g) Company officials	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
h) AAR list	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
i) Phone directory	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
j) CHEMTREC	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
k) OREIS link to carrier database	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
l) OREIS features (e.g., tank car, AMTRAK schematics, other features)	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
m) Other (specify)	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6

13. Please list the three things you like most about the current HazMat response system.

a) _____

_____

b) _____

_____

c) _____

_____

14. Please list the three things you dislike most about the current HazMat response system.

a) _____

_____

b) _____

_____

c) _____

_____

PART 3: Operation respond emergency information system use

Part 3 asks additional questions regarding the performance of the Operation Respond Emergency Information System. Your answers will provide us with valuable data that will help in evaluating the system.

15. Would you use the Operation Respond Emergency Information System? ❑ Yes ❑ No

Why? _____

16. Would you use any individual components of the Operation Respond system?

❑ Yes. Useful components: _____

Why? _____

❑ No. Why? _____

_____

17. Please indicate whether the Operation Respond Emergency Information System impacted incident management in any of the following ways:

a) Better coordination of first response information-seeking ❑ Yes ❑ No

Comments _____

b) Fewer steps in the decision process ❑ Yes ❑ No

Comments _____

c) Fewer agencies to be contacted ❑ Yes ❑ No

Comments _____

d) More timely identification of materials and material characteristics ❑ Yes ❑ No

Comments _____

e) Resolved incident(s) occurring at an odd time or location ❑ Yes ❑ No

Comments _____

f) Expedited emergency response decisions ❑ Yes ❑ No

Comments _____

18. Please list the three things you like most about OREIS.

a) _____

_____

b) _____

_____

c) _____

_____

19. Please list the three things you dislike most about OREIS.

a) _____

_____

b) _____

_____

c) _____

_____

20. Please note any other factors or considerations not covered in this report that may be important to effective first response emergency information management.

_____

_____

_____

_____

_____

_____

_____

_____

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