SIMULATION ANALYSIS OF OPERATION RESPOND IN A FIELD SETTING

Submitted to:
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EXECUTIVE SUMMARY

The Operation Respond lnstitute has been instrumental in developing the Operation Respond Emergency Information System (OREIS) for first responders to hazardous material spills in transportation settings. The Operation Respond system aims to facilitate rapid access to transportation carrier databases containing information on hazardous material cargo. As a consequence, first responders, such as police and fire department personnel, are expected to respond with increased speed and accuracy to potentially hazardous situations.

The Operation Respond Institute has charged the Texas Transportation Institute (TTI) to serve as an independent evaluator and to conduct simulations in a field setting to assess the degree of performance improvement likely with the OREIS. Operational Test scenarios in the Atlanta and Buffalo areas were devised to simulate the circumstances and information demands of hazardous materials response teams in transportation settings. These simulations contrived circumstances which parallel those commonly found in transportation hazmat incidents and measured the performances of various players, elapsed times, and decision processes.

In addition, a limited survey of first responders was undertaken to gauge the performance of OREIS in actual incident responses. Select first responders were interviewed in Pasadena and Harris County in Texas. The respondents were selected based on their experience in the actual use of OREIS during hazardous materials incident response. The survey attempted to assess first responder perception of the effectiveness of the existing information system components.

In order to further enhance the robustness of the evaluation of OREIS additional operational testing and collection of information on the performance of OREIS and the existing Department of Transportation (DOT) emergency response system may be required. TTI in collaboration with the Operation Respond Institute and other concerned agencies proposes to implement an evaluation plan for OREIS, its stand-alone features, and the existing DOT information system. The evaluation is proposed to be conducted in Contra Costa County, California and the adjoining eight Bay area counties. The research results will likely identify the value, if any, in integrating OREIS with the existing DOT system.

CHAPTER 1 - STUDY BACKGROUND

Introduction

In the Hazardous Materials Transportation Uniform Safety Act of 1990, Congress called on the National Academy of Sciences (NAS) to conduct a study of the feasibility and necessity of a central reporting system and a 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 the transportation of hazardous materials. A National Academy of Sciences' Special Report (No. 239,1993), titled "Hazardous Materials Shipment Information for Emergency Response," expressed a lack of support for implementation of a national central reporting system as described in the Act. The Report maintained that such a system would be too expensive and would be unlikely to function as intended. However, the NAS study forcefully acknowledged that there is a need to improve information for use by emergency responders at the scene of a transportation incident and recommended that a limited start-up of automated information systems be undertaken that builds on the existing resources of the industry that handles transportation of hazardous materials.

Operation Respond Emergency Information System

In line with the congressional mandate and the U.S. Department of Transportation's review of the NAS report for better transportation safety, the Federal Railroad Administration (FRA) and an industry consortium created the Houston Cooperative Emergency Planning Project, or Operation Respond in November 1992. Operation Respond was intended as a research and demonstration project designed to improve information available to first responders at a hazardous material incident. In 1995, Operation Respond became a not-for profit institute as a means to conduct further research and development.

A critical feature of Operation Respond is a computer link connecting 9 11 or fire and police dispatch centers to a transportation carrier database containing information about a vehicle's contents and instructions for handling them. Other services of the project include development of manuals and related first response protocols for emergency workers. According to an Operation Respond White Paper (November, 1996), the goal of the Operation Respond program is to develop a software system that is easy to use and inexpensive for police and fire departments to maintain for purposes of providing accurate and timely data to first responders. A component of its goals is to develop and improve training programs for first responders dealing with railroad and motor carrier accidents.

Conceptual Evaluation of an Automated Emergency Response Information System

In a previous study undertaken by TTI researchers, titled " A Benefit-Cost Evaluation of an Automated Information System for First Responders to Hazmat Spills in Railroad Settings" (Mathur and Roop, March 1995) identified the benefits and costs associated with the implementation of a computerized information system like Operation Respond. The evaluation suggested that the availability of more timely and reliable information to first responders to a hazardous material incident can have several favorable economic, social, and environmental impacts. Among the benefits were a reduction in the level of injuries, property losses, highway/track closings and delays, public evacuations, and other related difficulties that usually accompany hazardous materials incidents.

The conceptual assessment of the value of improved information for emergency responders at hazardous material incidents involved identifying:

- hazards and related risks;
- nature of emergency response decisions;
- information requirements of emergency responders;
- causes and consequences of information failures;
- frequency and magnitude of consequences of informational failure; and
- potential gains from a computerized information system.

Types of Hazmat Emergency Response Decisions

The conceptual study provided a classification of the types of emergency response decisions and linked a theoretical model with existing empirical evidence regarding the timing of the various types of emergency response decisions. The study discussed how a computerized, automated information protocol for emergency responders will impact the timing of decisions. The study emphasized that community decision processes at hazardous material incidents are seldom immediate and typically involved information seeking. Emergency response decisions were classified into three general categories:

> *1. Decision to Warn.* A response team's first decision is to warn the general public. This requires an initial awareness of danger; location and assessment of the hazard; communication of a hazard to a decision group; discussion of standard procedures and alternative responses to the existing hazard; and the implementation of the selected action.
>
> *2. Protective Action Decision.* This decision involves the selection of appropriate protective action(s) in response to an event. It also requires clarity of knowledge about what is at stake and what has to be done.
>
> *3. All-Clear Decision.* All-clear signals require monitoring and reassessment of the hazardous incident as it progresses to determine when the danger associated with the event no longer exists.

For any protective action to achieve its intended effectiveness, people must become aware of the potential for harm, decide to act., and implement the appropriate behavior to achieve protection. The literature reviewed in this earlier TTI study (Mathur and Roop, 1995), suggested that among emergency response decisions, most of the decisions to warn the public of an impending hazard are made rapidly, in the first 30-60 minutes of an incident, and that the protective action decisions are frequently incorporated in the decision to warn. The literature review supported the premise that decisions directed at the attainment of protection are arrived at more quickly than decisions that may (if made incorrectly) result in exposure, i.e., "safe-side" decisions seem to be made more quickly than decisions that might put people at risk. A more reliable information system is expected to shorten decision times, both when inaction leads to passive avoidance of exposure (e.g., wait-and-see response or delay in giving all-clear signals) and in instances when active avoidance decisions (evacuations) are made too quickly or inappropriately. Thus, it is contended that choices people make are sensitive to the perception of the outcome which in turn is linked to the availability of timely and reliable information to first responders. This has implications in terms of resource costs and minimization of consequences from a hazmat incident, as the key elements in an emergency situation involve the time of the incident, the time the decision to warn the public is reached, the time the protective action is selected, the time the warning begins and ends, and the time an all-clear is issued.

Categories of Information Failure

The earlier TTI study also examined informational needs of first responders. The examination provided a qualitative discussion of the information requirements, existing information sources, causes of information failures, and their consequences. Also addressed in the study is the potential reliability, accuracy, and efficiency that may be introduced with implementing an automated information emergency response protocol.

In this regard, the NAS Special Report (Number 239,1994) indicated that the existing system fails with some regularity. Perhaps most significantly, is the lack of full confidence first responders have in the existing system. The most common occurrence was missing information. Even when the information was in compliance with regulations and accessible, it was not adequate for responder needs, or information was insufficient because the shipment was exempt from regulation. Also, there are instances where the carrier transport crew or the driver was either unable or unavailable to communicate the required information.

In summary, six basic categories of information failure may be identified:

1. Required sources of information are missing or inaccurate (e.g., placards, shipping papers, etc.);
2. Information sources are obscured or inaccessible because of the crash, or fire, or smoke;
3. Failure to efficiently convey information (e.g., placard information was not descriptive enough or review of multiple shipping documents was too cumbersome);

4. Insufficient information or shipment was exempt from some federal hazmat transportation regulations;

5. Vehicle operator is unable or unprepared to provide information (e.g., train crew did not assist responders by providing onboard documentation); and

6. Responders failed to obtain or use available information (e,g., responders were unaware of all information sources or unprepared to take advantage of all available information).

An automated information system for emergency response is expected to improve the flow of information between transportation databases and community based emergency response personnel at hazardous material incidents. With information literally on the fingertips of emergency response dispatchers, those in the field responding to hazardous incidents may prepare a response more quickly and accurately.

Potential Benefits and Costs of an Improved Information System

The conceptual study presented a benefit-cost evaluation of a computerized information system as part of the standard procedures for hazardous material first response. The assessment quantified the public resource savings attributable to greater informational efficiency. These efficiencies were expressed in terms of speedier response in routine situations, the avoidance of unjustified traffic snarls, avoidable evacuation costs, and other consequences. The study reported estimates of general efficiency gains accruing from routine reductions in hazmat team response time based on two factors - reduction in emergency response time and value of hazmat team time.

Conclusion

The data used to assess the potential effectiveness of an automated information system were derived from an analysis of past incident reports, interviews with experts in the field, and from a taxonomy of the decisions made, steps and time invilved, and potential outcomes. It was found that case studies seldom cite elapsed time or define a precise sequence of events. The absence of this information created the need to deduce the chronology of typical occurrences and make some assumptions about how better information might impact incident outcomes.

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It is this paucity of "hard" data available for analysis that motivates additional research and testing. The findings presented in this report will augment the theoretical findings of previous research with empirical data. Empirical data is 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 contrive circumstances which parallel those commonly found at hazardous materials spills and measure the performances of various players, elapsed time, decision processes, and outcomes.

CHAPTER 2 - SIMULATION OBJECTIVES AND DESIGN FOR TESTING OPERATION RESPOND IN A FIELD SETTING

Research Objectives

An assessment of the existing emergency response information system and any improvements would require the documentation of its impact in terms of reduction of time spent seeking pertinent information and the related improvements in the timeliness and quality of on site decision making. Past examinations of the existing Department of Transportation (DOT) emergency response information system have been based on case studies and post-incident interviews. These sources of information are indirect in nature and rarely cite elapsed time or define a precise sequence of events. This creates a need to simulate typical occurrences and document how the existing information system components and improvements and innovations will impact hazmat transportation incident management and first response.

The purpose of the simulation analysis (operational testing) is to provide data necessary to determine the benefits that may be realized by the first responder community through the use of the Operation Respond Emergency Information System (OREIS).

The immediate research objectives of this research are to:

(1) Design and conduct operational tests of the Operation Respond Emergency Information System through hazmat incident response incident simulations;

(2) Document empirical data from the on-site simulations to measure effectiveness, performance, and suitability of OREIS vis-a-vis standard DOT information sources; and

(3) Survey/interview real-world use of the OREIS to make a qualitative assessment of its application

The evaluation of OREIS will be in terms of

- Reliability of cargo identification compared with existing means;
- Speed of identification;
- Effectiveness of alternate responder interfaces;
- Effectiveness of alternate means of interpreting commodity information; and
- Responder reactions (willingness to use the system, training, requirements, and effect on responder decisions).

The evaluation would require that the Operation Respond system be introduced in field simulations/operation tests that simulate a certain degree of hazard and allow documentation of first response events and actions. The existing Department of Transportation (DOT) emergency response information system will constitute the baseline for assessing incremental gains from incorporating the OREIS protocols. The test results will provide empirical data on first responder activities with Operation Respond versus tests without Operation Respond.

Detailed Test Design

Field Test Settings

The study design will call for alternating use/no use of Operation Respond software with standard procedures by hazmat teams at the selected testing communities/cities. A single simulation will consist of two field tests. The first test at a selected location will involve a first responder team that has access to some or all of the existing DOT system components (e.g., placards, shipping papers, rail car number, other) but not OREIS. The second field test will involve a hazmat team that has been trained in the use of the Operation Respond protocol. This part of the simulation will include OREIS with the conventional DOT information system,

In operational terms, at a preselected site, an actual tank trailer or rail tank car will be designated as a hazmat incident location. The first alarm will consist of a simulated report by a bystander *or* police patrol car to a 911 or fire dispatch center of a peculiar odor at the site. In response, local hazmat teams will act based on the incident notification. The on-site incident commander will be briefed about the nature of the spill and related symptoms. Essentially, the on-site visual symptoms to the incident commander may consist of smoke or wetness around the dome of a rail or motor tank car. Beyond these initial simulation controls, the first responder is expected to follow and implement standard first response procedures with and without OREIS. The object of scrutiny is not the first responders' training but rather the performance of the OREIS and accompanying baseline DOT information system components during the information seeking process.

The drill design will have control over some variables relevant for positive identification of materials being transported. The simulation design may require that some of the conventional information sources for visual confirmation/identification may or may not be immediately accessible. The main components of the conventional information sources are:

Rail car identification number;
Motor carrier identification number;
Placard symbols;
UN identification number;
Transportation carrier crew/company official; and
Shipping papers.

Access or the lack of access to the these information sources will highlight the nature of the information search on the part of the first responder and the significance of

Hazardous information display on vehicles;
Relevance of the Emergency Response Guidebook in the initial response phase;
Reliance on related information agencies; and
Use of OREIS.

Simulation Controls

The simulation will control the following:

1) *Beginning point (start* time). The simulation design will control the time and manner of notification of the hazmat incident to response team. It should be noted that manner of commencement of "information seeking" by first responders is not a control variable and will be documented as events unfold.

2) *Positive identification of the materials being transported.* The simulation design will control access or lack of access to conventional sources of information (e.g., placards, shipping papers, train crew, other). The design will be replicated with the pre-OREIS and post-OREIS tests (i.e., the respective tests with or without access to the Operation Respond Information System).

3) *Determination of degree of hazard posed by the materials being transported. The* simulation design will control the perception of the hazard by preventing the first responder from identifying the hazardous material solely by visual inspection.

The simulation design will permit an explicit record of the identification process of the hazmat and chemical characteristics, natural progress of the response action(s), potential response decisions, and protective actions based on information accessed.

Simulation Parameters

A community's decision processes at hazardous material incidents are seldom immediate and typically involve information seeking. Information needs are driven by the decisions that emergency responders must make by answering the following questions:

- What protective equipment is needed to approach the incident'?
- Does the danger of toxic exposure, fire, or explosion justify highway or track closing or evacuation?

- Should water or other chemicals be used to extinguish the fire?
- How to stop or contain a release?
- How to dispose of spilled material?

Timely access to emergency response information to hazmat incidents can have a demonstrable effect on the severity of the incident that ensues, on the nature of those effects, and on the range of response times. The simulation will be designed to allow elapsed time to be determined between critical points of the trial.

In line with study objectives to assess the likely impact the use of OREIS will have in real world situations, three discrete simulation elapsed time phases become relevant:

1) The time between the first alarm/response team's' arrival on the incident scene and the positive identification of the materials on board;
2) The time between the positive identification and the determination of the degree of hazard posed by the substance; and
3) The time between the determination degree of hazard and the selection of the best course(s) of action.

A chronological documentation of the following details will be undertaken

1. Initial report/alarm of incident;
2. Dispatch of hazmat team to incident site;
3. Arrival of hazmat team on incident site;
4. Initiation of frrst responder's search for information on vehicle's hazardous cargo; and
5. Usage of alternate information sources (existing DOT and Operation Respond information system components).

In addition, the simulation will attempt to capture qualitative aspects like the suitability, reliability, and accuracy of the OREIS vis-a-vis the existing information protocols.

CHAPTER 3 - OPERATIONAL TEST RESULTS OF OPERATION RESPOND IN A FIELD SETTING

Management and Responsibility

Texas Transportation Institute (TTI), as the independent evaluator, has been responsible for designing and overseeing the conduct of the evaluation tests, data collection and analysis, and preparation of the study results. The Operation Respond Institute has been responsible, besides managing the evaluation test schedule, for recruiting, training and deployment of OREIS among the target first responder communities. Participation of the transportation companies and the first responder community was voluntary.

TTI in collaboration with the Operation Respond Institute and other concerned agencies 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 Buffalo. The data needed to address the test objectives was compiled by TTI in cooperation with the participating transportation carriers and first responders. A combination of research, simulation, survey and interviews, and manually and automatically recorded log data served as the mechanism for the collection of the necessary information.

Field Simulations

The purpose of the tests is to provide the data necessary to determine the incremental benefits that may be realized by first responders through the use' of the OREIS The last chapter outlined simulation objectives and design, The study design called for alternating use/no use of OREIS along with standard procedures by hazmat teams in select testing communities/cities. A single simulation consisted of two field tests, a pre-OREIS test and a post-OREIS test. The pre-OREIS test involved a first responder team that has access to the existing DOT system components but not OREIS. The post-OREIS test involved a hazmat team that has been trained in the use of OREIS and included Operation Respond protocols with the existing DOT system.

Simulation I: Atlanta Railroad Yard Incident

	Pre-OREIS Test	*Post-OREIS Test*
Date:	March 4,1996	April 4,1996
Time:	3:00 p.m. through 4:00 p.m.	2:00 p.m. through 2:40 p.m.
Location:	Norfolk Southern Raiiway Yard Fortress Street, Atlanta, Georgia	Norfolk Southern Railway Yard Fortress Street, Atlanta, Georgia

Simulation Field Settings

i. Railroad yard tank car leak
ii. Atlanta Deputy Fire Chief, posing as a "bystander," notifies the Atlanta Fire Department Communications Center that an "odor was reported" at a railyard
iii. Hazardous material product unknown at the time of initial report
iv Shipping papers and rail company database show tank car to contain Chromium Trioxide Anhydrous, Division 5.1
v. Fire Communications Center dispatches hazmat squad to incident site
vi. Yard office is closed (simulated) during incident response

Pre-OREIS and Post-OREIS Simulation Performance

In both the with- and without-OREIS drills, the Atlanta Fire Deputy Fire Chief, posing as a bystander, called the Atlanta Fire Department Communications Center to report a pungent odor at a Norfolk Southern Railyard. The caller provided the railyard location and no additional information. Beyond the feigned alarm, the operational test was allowed to unfold independent of any other simulation controls. The fire communications center dispatched hazrnat "squad 4" to "check-out unidentified odor" at the railyard.

At the scene, the hazmat team was directed towards the designated tank-car that simulated a release in the form of wetness around the tank car's dome (see figure 3.1). While remaining at a safe distance from the release, the hazmat team crew used binoculars to survey the incident site and kept radio contact with the incident commander (see figure 3.2). The survey team looked for the car marking, labels, and placards on the tank car.

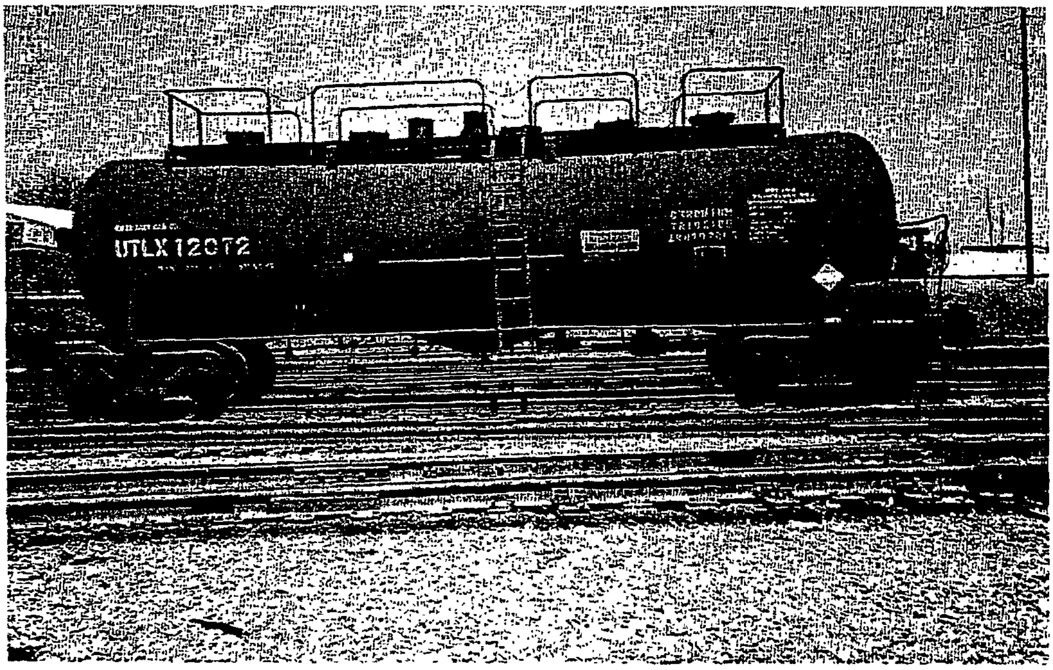

Figure 3.1 Atlanta Railyard Simulated Tank Car Leak

Figure 3.2 Atlanta Hazmat Crew Surveys Incident Site

The first response crew were able to read the placard and based on the UN number and placard description surmised that they were "dealing with an oxidizer" with 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. The hazmat team used the North American Emergency Response Guidebook (NAERG) and an in-vehicle information software called CAMEO to obtain material identity and response recommendations. Based on the tank car's 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 made a 500 foot evacuation decision.

A railroad company official, 48 minutes into the incident response, arrived on-scene and provided the incident commander with the relevant shipping papers. The simulation was stopped at the time the incident commander indicated that he had confirmation and verification about the identity of the chemical, its basic properties and knew how to proceed with the first response.

Table. 3.1 summarizes the pre-OREIS and post-OREIS Atlanta railyard operational tests. The test results are presented as a time log of incident response events. The time-log is articulated as if being clocked with a "stop-watch" with the chronology of relevant events being documented as minutes into the incident response. Therefore, the time log is set to 0:00 when the initial notification (alarm) of a potential hazmat incident is reported to the fire dispatcher and an incident response is initiated. In line with the objectives of the study, parameters of interest relate to the "information seeking*' activities of the first responder. This begins with the hazmat crew's arrival on the scene and the field survey. Critical events of interest are first responder activities to read car markings and placard descriptions, and the use of such information with other DOT information system components with and without OREIS.

Table 3.1 Atlanta Railyard Operational Tests

Pre-OREIS (minutes into incident response)		Post-OREIS (minutes into incident response)	
Events	**Time-Log (hr:min)**	**Events**	**Time-Log (hr:min)**
Alarm	0:00	Alarm	0:00
Response team on-scene	0:25	Response team on-scene	0:20
Response crew survey field	030	Response crew survey field	0:22
Response crew read placard and car markings	0:36	Response crew read placard and car markings	0:25
Incident commander requests information from crew -using ERG/Cameo and UN #	0:40	Incident commander requests information from dispatcher - using OREIS and rail car #	0:27
Protective actions - based on ERG recommendations and chemical descriptions	0:45	OREIS confirms placard description; provides chemical ID	0:29
Rail company official provides shipping papers	0:48	Dispatcher provides chemical properties and related protective actions using OREIS and rail car #	0:34-0:36
Verify car marking and protective actions (review shipping papers)	0:53	Verify car marking and protective actions (review shipping papers)	0:39
stop test	0:55	stop test	0:40

Figures 3.3 and 3.4 graphically display the pre- and post-OREIS Atlanta railyard field operational test chronology.

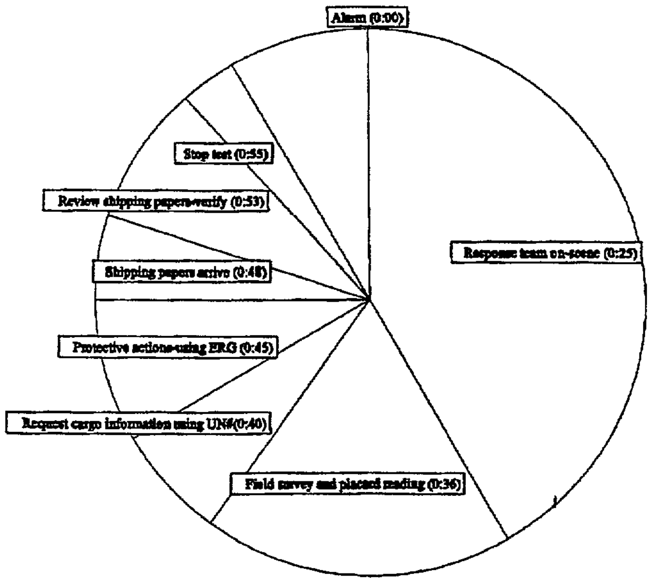

Figure 3.3 Atlanta Railyard Pre-OREIS Operational Test

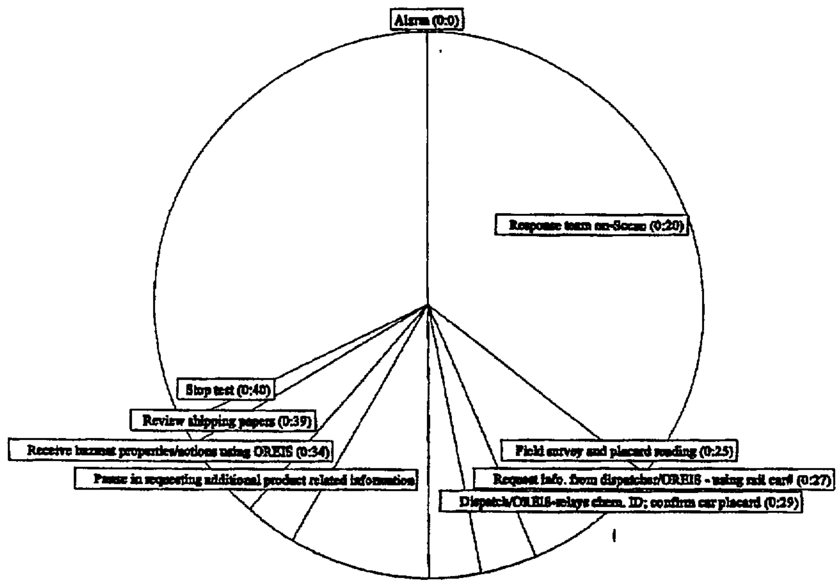

Figure 3.4 Atlanta Railyard Post-OREIS Operational Test

Review of Atlanta Railyard Simulation

Basis for Chemical Identification

The incident commander's quest for speedy and reliable information in the pre-OREIS test motivated the use of the UN number to obtain information on the tank car's cargo. The basis for chemical identification was the U.N. number in conjunction with the Emergency Response Guidebook (ERG). In both the pre- and post-OREIS tests, the U.N. number helped identify the cargo to be Chromium Trioxide, Anhydrous. It should be noted, however, that had the U.N. number does not always point towards a unique chemical identification, and in these cases, the emergency response guidebook would only have provided general guidance without a positive identification.

In the Pre-OREIS test the hazmat team was unable to use the rail car number effectively as a source of information on the contents of the car. The unavailability of shipping papers and the arrival of rail company officials 48 minutes into the test diminished the value of this information significantly. The incident commander was eventually able to match the rail car identification number with the shipping papers, verify placard information, and obtain a positive identification of contents of tank, but only after 48 minutes into the incident simulation.

The relevance of using the rail car number became critical in the post-OREIS test as the incident commander was aware that the fire department's communications dispatcher could use OREIS to access vehicle-specific information from the rail company's waybill database. As shown in Figure 3.4, the incident commander relayed the rail car number to the fire dispatcher at 27 minutes of the simulation. Within one minute of the relay, the dispatcher using OREIS, came back with chemical identification and confirmation of the placard's description. Access to shipping papers in the pre-OREIS test and OREIS in the post-test maintained the importance of using the rail car number to obtain hazmat identification, The tests clearly demonstrated that conventional sources need to be confirmed by shipping papers or rail company sources in conjunction with car number. Table 3.2 summarizes some aspects of the Atlanta railyard simulation.

Table 3.2 Atlanta Railyard Operational Test Summary Comments

Events	Pre-OREIS	Post-OREIS
Basis for Chemical Identification	U.N. ID No. and ERG (shipping papers arrive after 12 minutes of placard reading)	Rail Car ID No. (OREIS provides chemical I.D. within 4 minutes of placard reading)
Hazmat Properties and First Response	Placard description and Hazmat Guide No. (ERG: Oxidizer)	OREIS (Chromium Trioxide, Anhydrous; OREIS confirms placard description)
First Response Decisions	ERG recommendations (before positive chemical ID - within 9 minutes of placard reading)	OREIS recommendations (after) positive ID and a pause of 7 minutes (relayed in 2 minutes of requesting information)

Verification of Field Observations

Gains from having a more reliable and efficient information system for first responders at hazmat incidents has both quantitative (i.e., in terms of savings in emergency response times), and qualitative (i.e., in terms of improvements in responder confidence) implications.

First responders at hazmat incidents approach potential incidents with caution and tend to make “safe-side” decisions. Fist responders maintain some doubt regarding the efficacy and accuracy of conventional sources of information, therefore, there exists a need to confirm and substantiate rail-car hazmat markings. The additional redundancy that OREIS brings to the system is likely to promote first responder confidence.

In the post-OREIS test, the dispatcher using OREIS, besides providing chemical ID using the rail car number, was able to verify the tank car’s placard and U.N. number through OREIS. This initial confirmation of the field observations by the dispatcher is likely to reinforce the confidence of the first responder.

First Response Decisions

In the pre-test, based in the ERG guidance, the incident commander made first response decisions (e.g., evacuation) within 9 minutes of the tank car's placard reading. Shipping papers were received after 12 minutes following the placard reading. In the post-OREIS test, decision timing was improved with OREIS first response recommendations relayed by the dispatcher within 2 minutes of incident commander's request, and within 4 minutes of the placard reading.

Role of Dispatcher and First Responder Training

In the post-test, the incident command obtained chemical identification from the dispatcher at 2:29 p.m. or in 29 minutes from the initiation of the test. After a 5-minute pause, at 2:34 p.m. or 34 minutes into the test, the incident commander contacted the fire dispatcher to request for additional information relating to the hazardous cargo. This delay between the request for product identification and request for product properties and reiated first response recommendation may be attributed to the fact that the incident commander was probably unaware that additional information could be accessed from dispatcher and OREIS.

It is open to question whether the 911, police or fire dispatcher should play a more proactive role and prompt the incident commander in such a situation. The role of the dispatcher has changed with availability of the OREIS and the dispatcher now plays a more dynamic role during an incident response. The dispatcher's position has become more strategic as the OREIS protocols allow him or her to not only identify hazardous material cargo and its characteristics but provide the first responder with protective action recommendations. The dispatcher has been transformed from serving as an intermediary between the first responder at the incident site and some outside information to a more immediate information source itself.

Simulation II: Tonawauda Tank Trailer Operational Tests

	pre-OREIS Test	*Post-OREIS Test*
Date:	June 28,1996	September 13, 1996
Time:	9:00 a.m.- 9:40 a.m.	9:00 a.m. - 9:25 am.
Location:	Chemical Leaman Yard 470 Fillmore Avenue, Tonawanda, NY 14150	Chemical Leaman Yard 470 Fillmore Avenue, Tonawanda, NY 14 150.

Simulation Field Settings

I. Police officer on regular patrol calls 9 11 system and reports a puddle of liquid under a trailer
ii. Dispatcher alerts fire department advising that leak may be hazardous material
iii. Hazardous material product unknown at the time of initial report
iv Shipping papers and motor carrier show tank trailer to contain Toluene Diisocyanate
V. City and Town of Tonawanda dispatch two companies from the City of Tonawanda and Town of Tonawanda (Brighton)
vi. Unified command structure between the City and Town of Tonawanda (Brighton)

Pre-OREIS Simulation Performance

The pre-OREIS test was initiated at 9:00 a.m., on June 28,1996 with a police officer calling-in an “ alert” to the dispatch center. The officer reported a puddle of liquid under a tank trailer in the Chemical Leaman Tank Limes Yard in Tonawanda, NY. After reporting the incident, the officer left the yard and parked in the street in front of the yard entrance. The City of Buffalo and Town of Tonawanda response teams established an incident command down the street, upwind but not in view of the tank trailer.

The 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 company 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 the descriptions in the North American Emergency Response Guidebook (see figure 3.5). Following the review of shipping documents, two firefighters wearing protective turnout clothing and self contained breathing apparatus, entered the yard, located the leaking trailer, and verified its UN number. However, the entry team could not find the shipping pagers in the vehicle. The incident commander contacted Chemtrec to confirm chemical properties and related first response recommendations. The simulation concluded at 9:40 a.m. when the incident commander expressed confidence in the accuracy of the information about the chemical properties of the material and related first response recommendations.

Figure 3.5 Tonawanda Incident Commander Reviews **Documentation**

Post -OREIS Simulation Performance

The post-OREIS test was initiated at 9:00 a.m., on September 13, 1996. This test began with a police officer calling his dispatch center to report a vapor cloud around a tank trailer located at a Chemical Leaman tank yard in Tonawanda, N.Y. (see figure 3.6). The 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.

Figure 3.6 Simulated Vapor Cloud Around Tank Trailer, Tonawanda

The responding fire department equipment parked near the police car and established an incident command system (see figure 3.7). The incident commander sent one firefighter to the suspect vehicle to retrieve shipping papers. Meanwhile, the incident commander requested the dispatcher to send a printed copy of the OREIS information.

Upon obtaining the 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 at 9:25 a.m. 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. Table 3.3 summarizes the pre- and post-OREIS operational tests at the Chemical Leaman tank yard in Tonawanda, N.Y.

Figure 3.7 First Responders On-Site at Tonawanda Truck Yard

Table 3.3 Tonawanda (NY) Truck Terminal Operational Tests

Pre-OREIS (minutes into incident response)		Post-OREIS (minutes into incident response)	
Events	**Time-Log (hr:min)**	**Events**	**Time-Log (hr:min)**
Alarm (police patrol car)	0:00	Alarm (police patrol car)	0:00
Response team on-scene	0:05	OREIS relays back information on chemical ID, properties	0:04
Shipping papers accessed from yard office; Company official joins incident command	0:09	Response team on-scene	0:05
Shipping paper information relayed to fire dispatch	0:11	Incident commander requests OREIS hard copy	0:08
Visual placard reading and verification	0:27	Fire dispatcher's OREIS papers arrive (search based on UN#)	0:22
Motor carrier official continues to assist incident command	0:28	Shipping papers accessed from tanker, verify UN#	0:24
Verify with CHEMTREC (access vehicle shipping papers)	0:36	Simulated leak stopped	0:25
Stop test	0:40	Stop test	0:25

Figures 3.8 and 3.9 graphically display the pre- and post-OREIS Atlanta railyard field operational test chronology.

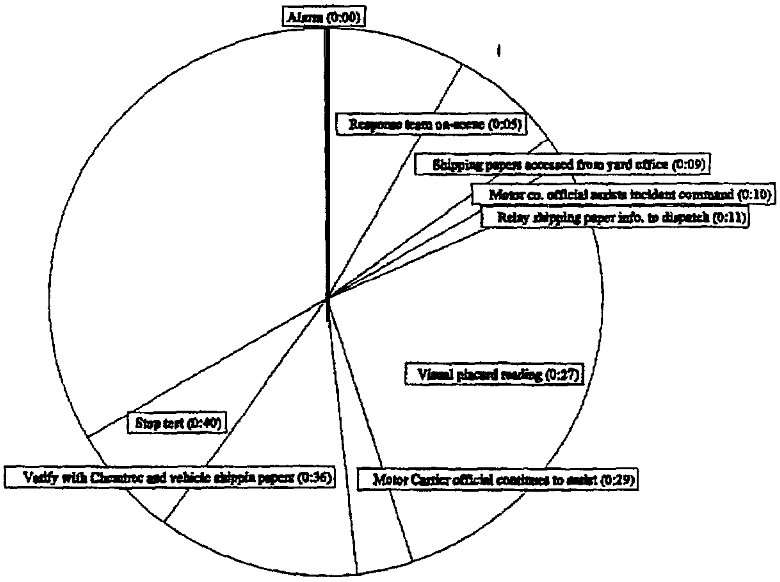

Figure 3.8 Tonawanda Tank Trailer Pre-OREIS Test

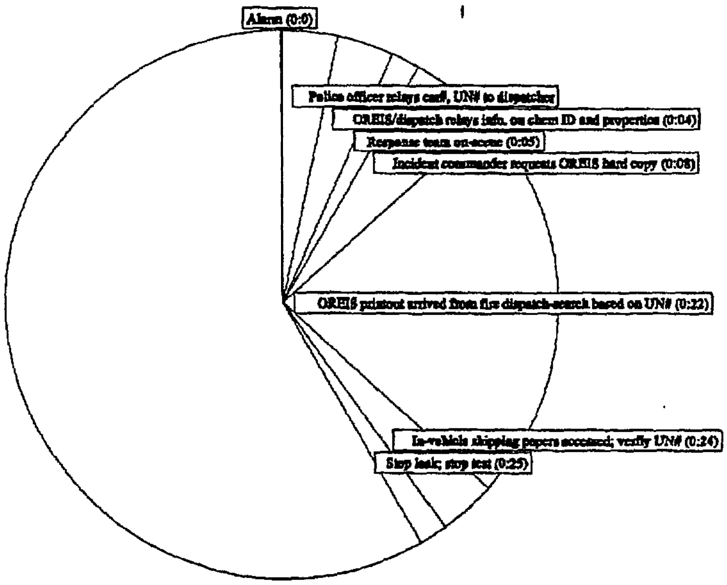

Figure 3.9 Tonawanda Tank Trailer Post-OREIS Test

Review of Tonawanda Truck Terminal Simulation

Basis for Chemical Identification

In the pre-OREIS testing, the most immediate source of chemical identification were the shipping papers. The incident commander procured the shipping papers and the MSDS report from the yard office within 4 minutes of setting-up the incident command. At this point, about 11 minutes had elapsed since the first alarm was reported by the police officer. Also, at the very outset, the incident commander sought the assistance of a Chemical leaman expert and requested that the representative participate in formulating the incident response. The presence of the company official is likely to have impacted the incident response. The company official played an integral part in assisting the responders review the shipping documents and MSDS report.

The pre-OREIS test provided a useful illustration of an "expert-assisted" scenario. The ready availability of shipping paper information and the assistance from the Chemical Leaman expert may have created less need to rely on other sources of information, like the vehicle placard, early in the process. In this regard, the use of the leaking tank trailer's placard and markings to confirm the hazardous product was later in the exercise. The order in which information sources were accessed by the incident command was as follows: shipping papers and the company official, NAERG, vehicle placards and markings, and Chemtrec. This sequence of events suggests a tendency to rely first on the most direct, precise and locally available sources of information, followed by the less specific and indirect sources as the team worked to resolve the incident.

It was apparent in the exercise that the need to positively identify and verify the hazardous product was paramount before any response action was to be taken by the responders. The responders indicated that emergency measures would have been initiated only after a visual inspection of the placard confirmed what the shipping papers described. The NAERG was used to further corroborate the information available to the responders. In addition, the incident command sought confirmation from Chemtrec regarding the appropriate response equipment and protective actions.

First Responder Training and Awareness

The post-OREIS test demonstrated, besides the performance of the Operation Respond Information System, the potential impact first responder training and awareness can have on incident response. The pre-test police officer, beyond reporting the incident, did not play a very active role in the incident response. The concerned officer could have used binoculars to undertake a visual inspection of the tank trailer, its placard and identifying markings and ultimately have played a more significant and interactive role in the resolution of the incident.

In the post-test, the police officer had, besides OREIS, Hazardous Material Awareness Training (HMAT). In the exercise, the police officer expedited the flow of information to the responding fire department personnel. The officer, using binoculars, read the leaking trailer car identification number, placard and UN number. He relayed this information to the dispatcher. With the officer's report, the dispatcher was able to use OREIS to obtain product identity, chemical properties and first response recommendations within the first four minutes of the alarm. The dispatcher relayed this information while the response team was on its way to the incident site. Therefore, the hazmat team was able to arrive on the scene prepared to expedite a safe and appropriate response. Table 3.4 summarizes comparative observations regarding the pre-OREIS and post-OREIS test.

Table 3d.Tonawanda Truck Termainal Operational Test Summary

Events	Pre-OREIS	Post-OREIS
Basis for Chemical Identification	Company expert, shipping papers, placard description, UN# and Truck# (Chemical ID was within I I-14 minutes of the first alarm)	OREIS information search based on Truck # (OREIS/dispatcher provides chemical I.D. and properties in 4 minutes of incident alarm and while response team is en route to incident site)
Hazmat Properties and First Response	Company expert, shipping papers, NAERG	OREIS, NAERG, OREIS printout, shipping papen
First Response Decisions	Company expert, NAERG, Chemtrec recommendations	OREIS recommendations en route to site, NAERG, shipping papers

Simulation III: Buffalo/Cheektowaga Railyard Operational Tests

	Pre-OREIS Test	*Post-OREIS Test*
Date:	June 29,1996	September 13,1996
Time:	10:00 a.m.- 11:05 a.m.	1:20 p.m.- 2:05 p.m.
Location:	Conrail Frontier Yard Harlem Road and Walden Avenue Buffalo/Cheektowaga, New York	Conrail Frontier Yard Harlem Road and Walden Avenue Buffalo/Cheektowaga, New York

Simulation Field Settings

i. Railroad yard tank car leak in a full operational yard; management and employees are on duty in a 24-hour environment

ii. Car Department Inspector during routine inspection smells pungent odor, evacuates area informing Frontier Control Tower of the problem. Frontier Control Tower call Emergency 911 - information relayed to dispatch center

iii. Hazardous material product unknown at the time of initial report

iv Shipping papers and motor carrier show tank trailer to contain Chlorine

v. Frontier yard is split between the City of Buffalo ant the Town of Cheektowaga and therefore becomes a "Joint Operation Alarm" between the City and Town

Pre-Test Simulation performance

At 10:00 a.m. on June 29,1996 a radio report from a car inspector working in the Walden Avenue yard indicated the presence of a pungent, suffocating odor. The inspector evacuated the area notifying his supervisor at Frontier Control. Upon notification, the trainmaster called 911 to report the incident. The 911 dispatcher notified Buffalo Fire Dispatch, conveying a "Preliminary Signal" to which an engine company, a ladder truck, and a battalion chief responded, Buffalo fire dispatch also alerted the Cheektowaga Police/Fire Dispatch, which alerted the Rescue Volunteer Fire Company. The Company responded with a pumper, a heavy rescue command center and the Town Hazmat and Disaster Coordinator. Upon arriving at

Conrail Yard Entrance number 6, a "combined incident command system" was set up (see figure 3 .l 0). A Conrail trainmaster 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. The entry team reported back to incident command information on the tank car number and a stencil marking indicating Chlorine (see figure 3.11). The incident command started gathering information using the NAERG and Cameo. 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 U.N. number in the NAERG, the simulation was called to an end at 11: 05 a.m.

Following the drill, first responders discussed the simulation performance in terms of problems associated with the identification of individual rail cars in the yard. The discussion centered on problems associated with finding yard entrances, emergency routes within the yard, and communications between Frontier Control and the fire dispatchers from both Buffalo and Cheektowaga.

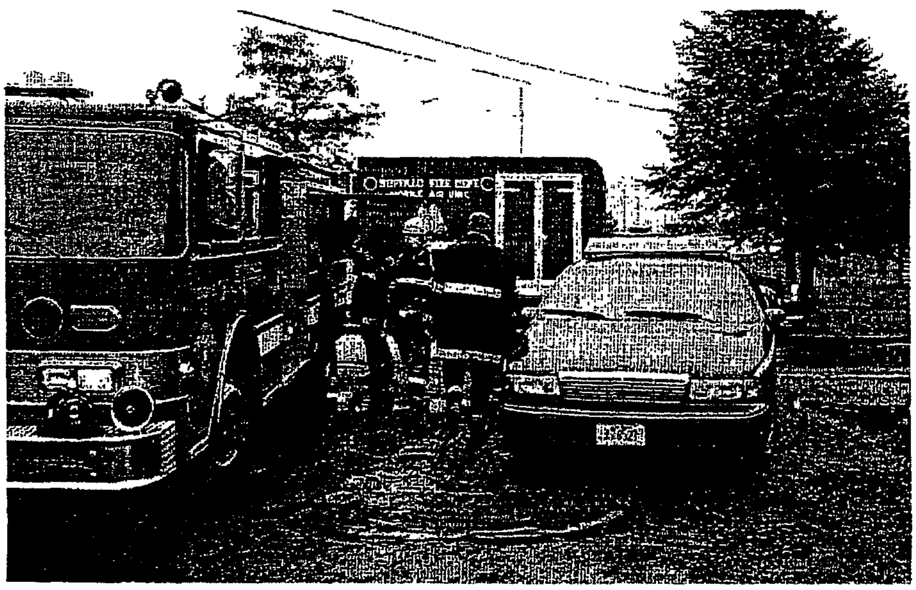

Figure 3.10 Buffalo/Cheektowaga Incident Response

Figure 3.11 Buffalo/Cheektowaga Railyard Simulated Tank Leak

Post-OREIS Test Performance

At 1:20 p.m. on September 13,1996, a radio report from a car inspector working in the Walden Avenue Yard indicated the presence of a pungent, suffocating odor. The inspector evacuated the area notifying his supervisor at Frontier Control. Upon notification, the trainmaster called 911 to report the incident. The 911 dispatcher notified **Buffalo** Fire Dispatch signaling a Level 1 Hazmat Incident to the City of Buffalo Hazmat teams. The City of Buffalo responded with two engine companies, two ladder trucks, a Rescue 1 -Heavy Rescue Unit, an F-9 Haz-Mat Vehicle, one Light and Breathing Air vehicle, a battalion chief and a division chief.

The Buffalo Fire Dispatch also alerted Cheektowaga Police/Fire Dispatch, which notified the Rescue Volunteer Fire Company. The Company responded with a pumper, a heavy rescue command center and the Town Hazmat and Disaster Coordinator. Upon arriving at Conrail Yard Entrance number 6, a "combined incident command system" was setup. A Conrail trainmaster joined the incident command system and provided location information, but no product material' details. The incident command team sent two firefighters in protective clothing with Special Clothing and Breathing Apparatus (SCBA), to locate the tank car in question and relay its car identity number and UN number. The entry team, using binoculars, read the car number but could not identify the vehicle's placard or U.N. 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 SCBA's Both dispatch centers using the OREIS computer system retrieved information using the rail car number. OREIS accessed the rail company's waybill file. 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 Chiefs 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 concluded at 2:05 p.m. Table 3.5 summarizes the pre- and post-OREIS operational tests.

Table 3.5 Buffalo/Cheektowaga Railyard Operational Tests

Pre-OREIS (minutes into incident response)		**post-OREIS (minutes into incident response)**	
Events	**Time-Log hr:min**	**Events**	**Time-Log hr:min**
Alarm	0:00	Alarm	0:00
Response team on-scene	0:13	Response team on-scene	0:11
Field Survey begins	0:18	Field Survey begins	0:11
Car Markings (Chlorine; Car #, unable to read placard, UN#)	0:31	Car markings (car #, unable to read placard, UN#)	0:32
Relay car # to fire dispatcher	0:36	Relay car # to fire dispatcher	0:35
Fire dept/trainmaster in yard tower confirm vehicle number and chemical (placard not read)	0:41	Buffalo fire dispatch, using OREIS identifies, placard number (printout copy sent bv police car)	0:39
Looking up ERG and Cameo for chlorine	0:42	OREIS printout from fire dispatch and Conrail MSDS report from railroad arrive; verify car marking actions	43
Papers from yard tower arrives, review papers and CAMEO, NAERG	0:44	Stop test	0:45
Two sources of verification (Conrail waybill paper and NAERG UN#)	0:58		
Conrail tower/police confirm tank car is empty	1:02		
Stop test	1:05		

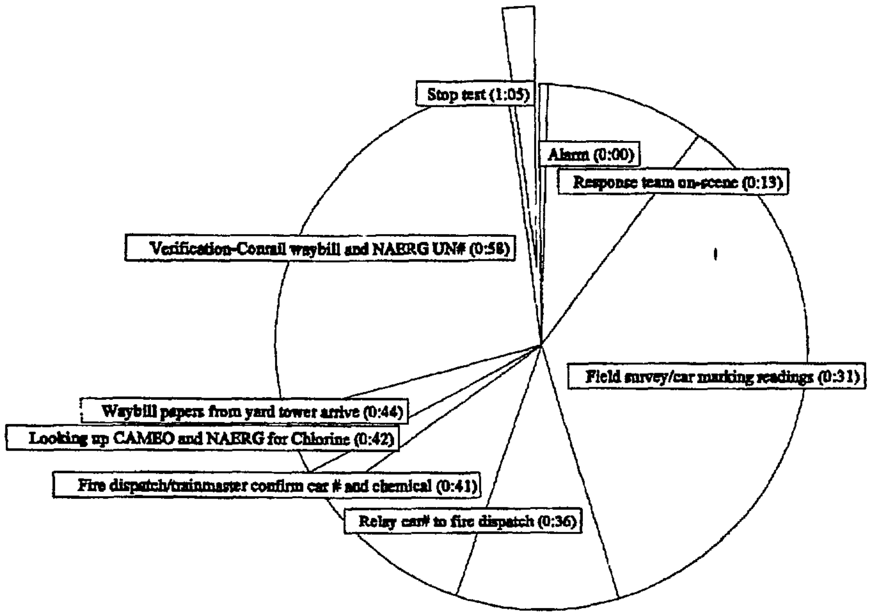

Figure 3.12 Buffalo/Cheektowaga Railyard Pre-OREIS Test

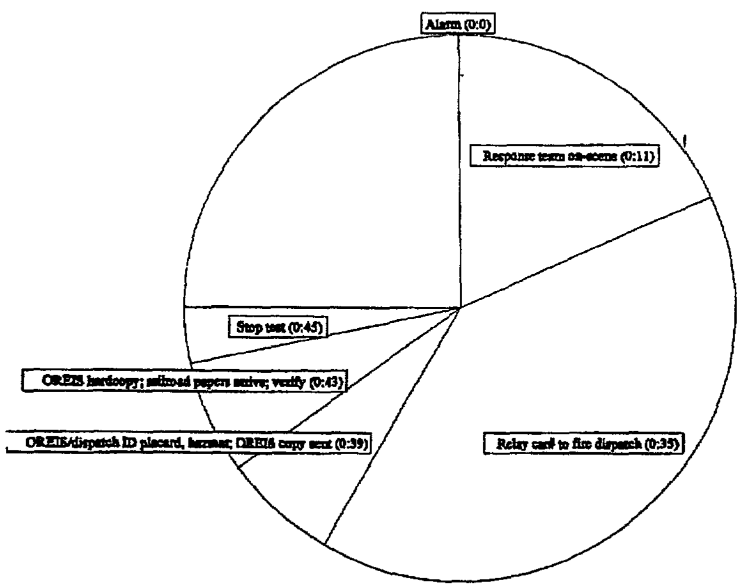

Figure 3.13 Buffalo/Cheektowaga Railyard Post-OREIS Test

Review of Buffalo/Cheektowaga Railyard Simulation

Basis for Product Identification

In the pre-test, the incident command relayed car markings (rail car number, Chlorine stencil) to the fire dispatcher within 5 minutes of field observation. The yard tower, through fire dispatch, responded within 5 minutes with product identity and car number confirmation. In total, 8 minutes elapsed between the time the car number was reported and the time the yard tower papers arrived on the scene.

In the post-test, OREIS performed very well. The incident command relayed the rail car number to the fire dispatcher within 3 minutes of field observation. The dispatcher, using OREIS and rail car number, responded within 4 minutes with product identity, placard description, car number confirmation, and related response recommendations. In addition, the dispatcher sent OREIS printout by police car to incident site. The OREIS hard copy took about the same time as the "conveniently located" yard tower papers took to arrive on-site . It should be noted that had the first responder vehicle's fax equipment been functioning - access to the OREIS printout would have been even faster.

Effectiveness of Car Markings

In both the Pre- and Post OREIS tests, the first responder "entry team" could read the rail car number but not the placard description. In the pm-test the leaking tank car was placed closer to Harlem Road, but had a box car in front of it, blocking the placard and car number. In the post-test, the suspect tank car was placed further away from Harlem road, though on the same, but curving track. It too had a box car in front. In comparison to placard and related hazmat markings, rail car ID numbers (UTLX numbers, etc.) are prominently displayed on the sides of rail cars and may therefore be easier to observe. The rail car number tends to serve as an effective basis for identifying cargo when used in conjunction with rail company documentation, in direct contact with rail company officials, or through OREIS.

OREIS Performance Effectiveness

The field settings of the simulation pre-OREIS and post-OREIS tests were in fairly ideal conditions. The first responder had access to adequate resources due to the incident site being located in Buffalo and Cheektowaga. The railyard is situated close to a yard tower with employees and management functioning in a 24-hour environment. Given the convenience of an easily accessible yard tower and other resources available to the first responder, the pre-OREIS emergency response components performed well. However, the Operation Respond system's performance was also comparable. This points towards OREIS' potential performance value when the incident conditions are not ideal, and the response may have to be undertaken in more isolated situations. Table 3.6 summarizes some comparative aspects of the railyard tests the Buffalo-Cheektowaga area.

Table 3.6 Buffalo/Cheektowaga Railyard Operational Test Summary

Events	Pre-OREIS	Post-OREIS
Basis for Chemical Identification	Rail car # Yard Tower (Yard tower/Fire Dept. confirm in 5 minutes of rail car# relaying)	Rail Car ID No./Fire Dispatch (OREIS provides chemical I.D. within 4 minutes of car# relaying)
Hazmat Properties and First Response	NAERG, CAMEO, Yard tower papers	OERIS (confirmed Placard description), OREIS computer printout, Waybill papers
First Response Decisions	NAERG/CAMEO recommendations	OREIS/NAERG recommendations

Simulation Overview and Conclusion

Chemical Identification

The various pre-OREIS and post-OREIS tests demonstrated that the first responders were able to incorporate the Operation Respond protocols consistently with the existing information system components. A subtle, but important aspect that is apparent with the introduction of OREIS is that the rail or motor car 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 rail car number is less relevant, The first responder has to wait for confirmation and verfication of field observations. Operation Respond allows early confirmation of field observations by verifying placards descriptions, car markings and related first response recommendations.

First Responder Training

The objective of the field tests was not to assess first responder training and hazmat awareness, but to assess the incremental benefits of incorporating OREIS protocols with the existing system components. It was clear from responder performances in the pre- and post tests that a significant positive spillover related to the introduction of OREIS in first responder communities is the provision of training and hazmat awareness.

The Operation Respond Institute has been responsible, besides managing the evaluation test schedule, for recruiting, training and deployment of OREIS among the target first responder communities. Participation of the transportation companies and the first responder community was voluntary. The training programs which were instituted to introduce OREIS among the first responders seem to have more direct impact on the communities response capabilities. Therefore, the pre-OREIS and post-OREIS field test comparisons have to be qualified by this aspect. Increased awareness and training has left its mark in the wake of the introduction of OREIS among the first responder communities.

Role of the Dispatcher

The field tests demonstrate the changed role of the 911, police, or fire dispatcher during au incident response. The dispatcher can now play a more direct and proactive role in providing information to the first responder in the field. In this regard, as a matter of routine, the dispatcher should provide OREIS output/printout to the first responder based not just on a search initiated using the UN number, but include a search based on the rail car number. In the event that the first responder does not request all the information available from the dispatcher, the OREIS software should prompt the dispatcher to be forthcoming with additional information.

CHAPTER 4. SURVEY OF ACTUAL USES OF THE OPERATION RESPOND EMERGENCY RESPONSE SYSTEM

Introduction

The essential goal of any improvements to the existing emergency response information system is to improve the flow of information between the transportation carrier and community based emergency response personnel. Apart from tangible benefits of speedier information access, increased accuracy and timeliness is expected to have a positive impact on the first responders' confidence and decision makiig during an incident.

Central to evaluating the benefits and effectiveness of OREIS is an assessment of all standard information sources available to the first responder. This chapter summarizes a limited survey of instances of actual "real world" uses of OREIS in the Houston/Pasadena area in Texas, The survey focusssed on gauging first responders' perception of the effectiveness of alternate emergency response information sources in terms of cargo content verification and related information accessibility.

Survey Approach

Select first responders were interviewed in Pasadena and Harris County in Texas. The respondents were selected based on their experience in the actual uses of OREIS during hazardous material incidence response. A total of four respondents were interviewed, two were from the Harris County Sheriffs Department and two from the Pasadena Police Department in Texas.

The respondents were asked to rate the emergency response information sources using a six-point scale ranging from Excellent (1) to Very Poor (6). The survey document listed the following information sources: (1) Shipping papers (Rail/Motor), (ii) Rail/Motor Crew; (iii) Placards, (iv) Car ID No., (v) UN. ID. No., {vi) NAERG, (vi) Chemtrec, (viii) Rail company, (ix) Motor carrier, (x) OREIS, and (xi) other.

The respondents rated the information system sources in terms of its information content effectiveness and its perceived accessibility and reliability during an incident response. Additional questions focussed on the performance and use of components of OREIS during actual incident responses.

Survey Results

Information Content of Available information Sources During Incident Response

Table 4.1 presents the survey respondents' ratings regarding the information content effectiveness of various emergency response information system components during an incidence response. The respondents used the following six-point rating scale:

Excellent	=	1	V-Good	=	2	Good	=	3
Fair	=	4	Poor	=	5	V-Poor	=	6

Table 4.1. Information Content Effectiveness of Sources

Item No.	Information Source	Effectiveness to Obtain Material Identity (Ratings)	Effectiveness to Obtain Material Properties (Ratings)
1.	Shipping Papers (Rail/Motor)	*3,4,2,1*	*4,3,3,1*
2.	Rail/Motor Crew	*4,4,2,3 ,*	*4,4,2,3*
3.	Placards	*4,4,2,4,*	*4,4,3,6*
4.	Rail Car ID No.	*3,3,1,4.*	*4.4,2,6*
5.	U.N. ID. No.	*4,4,2,4*	*4,4,2,6*
6.	NAERG	*4,4,2,4,*	*2,4,2,4*
7.	CHEMTREC	*3,3,2,3*	*3,2,23*
8.	Rail Company	*4,4,1,3*	*3,3,2,3*
9.	Motor Carrier	*4,3,2,3*	*3,3,2,3*
10.	OREIS	*3,2,1,3*	*2,3,1,3*

Perception of Accessibility and Reliability of Information Source

Table 4.2 presents the respondents' ratings on an information source's perceived accessibility and reliability during emergency incident management. Again, the respondents used the same six-point rating scale.

Table 4.2. Perceived Accessibility and Reliability of Information Source

Item No.	Information Source	Source's Accessibility (Ratings)	Source's Reliability (Ratings)
1.	Shipping Papers	3,5,3,4	3,4,2,3
2.	Rail/Motor Crew	4,5,4,4	4,4.2,3
3.	Placards	4,4.2.6	4,5,2,4
4.	Rail Car ID No.	3,4,1.3	3,4,2,3
5.	U.N. ID. No.	4,4,2,3	4,4,2,4
6.	NAERG	4,4,2,2	4,4,2,4
7.	CHEMTREC	3,4,2,2	3,3,2.2
8.	Rail Company	3,3,1,2	3,3,2,2
9.	Motor Carrier	3,3,2,2	3,3,2,2
10.	OREIS	2,3,12	2,3,1,2

First Responder Comments

The respondents based their reflections on experiences over a 5 month period in which the Operation Respond system was put to use in about eight incident response instances. The most frequently used components of OREIS during incident response included accessing information related to the rail car number, placard descriptions, U.N. number, and OREIS phone directory listings.

Alternate Information Sources

Comments regarding alternate emergency response system components include concerns that placards may be subject to “vandalism” or may “not be there” after a “crash” In addition, some respondents observed that among other information sources, “ Chemtrec gives material characteristics but not necessarily vehicle-specific product identification.” However, the importance of shipping papers remains as a source for confirmation and verification.

Some of the respondents observed that the first responder community mostly consisted of “volunteer” groups and relied on the police or fire department for information. The respondents felt that shipping papers may prove to be “hard to understand” while using the rail car number with OREIS smooths information access.

Coordination

The perception of smoother and more efficient information access with OREIS may also be due to the notion of “automation” injected into the information management process. The respondents felt that the information search is reduced to a “two-step” process with computerization “simplifying” the process. Respondents also perceived that since OREIS links them directly to the transportation carrier’s database they have will greater reliability in information access.

The respondents also observed that the first responder hesitates to call a “bunch of numbers” and generally contacts the police or fire department for information. With OREIS, the dispatcher is better equipped to respond to incident management information needs. However, all respondents felt strongly that access to rail companies was fairly streamlined and that having a link to motor carrier databases will be extremely valuable.

First Responder Training and Awareness

The survey 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.

It was indicated in the survey interviews that the police department now sees their role to be beyond just "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 to provide better support to fire departments during incident response.

Further, the respondents 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 being a "middleman" between the first responder at the incident site and some outside information source to become the "information source" itself.

Performance and Use of Components of OREIS During a Transportation Incident

The respondents felt that 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 better coordinated as it allowed coordination with the fire or police department dispatcher. Therefore, in some instances, reduce the number of steps as fewer outside agencies may have to be contacted. The respondents were appreciative of computerized access to information which otherwise can only be obtained from disparate "paper" sources like the shipping papers, NAERG, etc. However, the respondents suggested that they will continue to use other information sources besides OREIS It was indicated that if any incidents were to occur at an odd time or location, OREIS is likely to impact favorably on the first response in terms of decisions to warn the public, protective actions, and all-clear decisions.

The survey respondents 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 out till they get confirmation" of first response information. The respondents felt that there was a need for greater awareness of use of first response information sources and OREIS among the first responder community.

CHAPTER 5. FUTURE LINES OF INQUIRY

Introduction

An additional research phase has been proposed to further enhance the robustness of the evaluation of the Operation Respond Emergency Information System (OREIS). This would require operational testing and collection of information on the performance of the existing U.S. Department of Transportation (DOT) emergency response information and OREIS. The research results are expected to add to the understanding of the frequency, causes, and consequences of information failures.

Scope of Work and Research Objectives

TTI in collaboration with the Operation Respond Institute Staff and other concerned agencies will conduct evaluation exercises of OREIS, its "Stand-Alone" features and the existing DOT information system. The evaluation exercises are proposed to be conducted in Contra Costa County, California and the adjoining eight Bay Area Counties (Alameda, Marin, Sacramento, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma).

The scope of the evaluation of the Operation Respond system will consist of the following two aspects.

(1) Conduct of one pre-OREIS and one post-OREIS operational test exercise in Contra Costa County. The objectives of the operational testing (simulation) are to demonstrate

- the nature and extent of first responder information needs
- value of the improved information to emergency responders
- related organizational, technical, and cost-effectiveness issues addressed by an emergency response system
- value, if any, of the OREIS software to improve content information and

emergency response actions concerning hazmat shipments by highway which require a dangerous placard.

(II) Design and implement an evaluation plan to provide a framework to compare

- use of OREIS in Contra Costa county
- use of OREIS "stand-alone" features in select eight Bay Area counties around Contra Costa County
- use of DOT's information system in select eight Bay Area counties around Contra Costa County

Operational Testing

The design and conduct of the pre-operational test at a non-OREIS site within Contra Costa County will aim to measure the (DOT's) current hazard identification and emergency response requirements (DOT's system) which are addressed in five components: shipping papers, marking, labeling, placarding, and emergency response information. The proposed evaluation exercises in Contra Costa County, California consisting of a pre- and post-OREIS operational test, will involve participating carriers and local first responders. Experience gamed from prior operational testing in Atlanta and Buffalo will serve as valuable inputs in designing test procedures for Contra Costa, California.

Experimental Group

The operational tests will be combined with any actual uses of OREIS software and protocols during real emergency response to transportation incidents. This shall serve as the "experimental" group. The proposed evaluation plan shall include an appropriate methodology and framework to capture data and documentation related to actual uses of OREIS in Contra Costa County, CA during the demonstration period. The "experimental" group demonstration period will be of approximately 300 days.

Control Group

A "control" group shall consist of a sufficient number of sites located in the other eight Bay Area counties to capture data related to actual uses of DOT's system involving an emergency response at the scene of rail or highway hazmat transportation incident. In consultation with the Operation Respond Institute and other concerned agencies, TTI may need to undertake simulated exercises in some, or all, of the Bay Area counties to build a more robust data set on hazmat incidents involving DOT's system. The "control" group demonstration period will be of about 150 days, beginning concurrently with the time-frame established for the "experimental" group.

OREIS Stand-Alone Features in Actual Use

Immediately following the completion of the "control" group demonstration period, Operation Respond Institute proposes to install OREIS "stand-alone" software at the same sites used for the "control" group in the eight Bay Area counties. The term "stand-alone" loosely implies the use of the OREIS software and protocols without a direct link or hook-up with transportation carrier databases. The evaluation plan shall outline procedures to conduct a step-wise evaluation of OREIS' "stand-alone" features related to automated emergency response guidance, placards, United Nations or North American identification numbers, uniform reporting of hazmat data in the rail and trucking communities, and other stand-alone features unrelated to the interrogation of carrier data bases. The OREIS "stand alone" demonstration period will extend about 150 days and concurrently with the "experimental" group demonstration.

Conclusion

The research results will likely identify the value, if any, the eight Bay Area counties may receive if they were to integrate OREIS or only its "stand-alone" features with the existing DOT system. To the extent possible, the study will attempt to extrapolate the research findings from the nine Bay Area counties to assist other communities in the Nation.