

1997

INTERNATIONAL OIL SPILL CONFERENCE

Improving Environmental Protection - Progress,
Challenges, Responsibilities



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1997 International Oil Spill Conference

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Proceedings

1997
International Oil Spill
Conference
Improving Environmental Protection
Progress, Challenges, Responsibilities

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FOREWORD

This 1997 International Oil Spill Conference is the 15th biennial event since the first conference held in December 1969. The conference is jointly sponsored by the following:

American Petroleum Institute (API)
United States Coast Guard (USCG)
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International Maritime Organization (IMO)
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Through the combined sponsorship and participation of these distinguished industry and regulatory agencies, this conference has evolved into the world's premier symposium on oil spill issues. Participants, delegates, presenters, and exhibitors are all able to share current information and thoughts on the leading oil spill topics of today, and these conference proceedings become critical references for all who work in the field.

The conference goal is unchanged since 1969: "... to delineate the overall dimensions of the oil spill problem, explore the present state of prevention and control of oil spills, and review the relevant research and development efforts of government and private industry around the world."

The theme of the 1997 Conference is "Improving Environmental Protection—Progress, Challenges, Responsibilities." Technical papers and exhibits will stimulate discussions in many aspects of spill prevention, response planning, and research and development. Case studies will disclose what we are learning, and a special session on the February 1996, Milford Haven, United Kingdom spill from the *Sea Empress* will provide new insight into understanding the effects of that large spill and its response, which involved a large use of dispersants. In addition, the sponsors have commissioned and funded the preparation of the following issue papers that will be featured in open discussion forums.

"Putting Dispersants to Work: Overcoming Obstacles"

"Differences in Risk Perception: How Clean is Clean?"

"International Responsibilities: Are We Our Brother's Keeper?"

The sponsors of this conference thank each of the authors and reviewers of the papers that constitute these proceedings. We also thank all panel members, session chairs, and members of planning committees, along with all others who have contributed time and effort to make this conference a success.

Thomas R. Moore

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SESSION CHAIRMEN

Program Sessions	Chairmen
I—MONDAY, APRIL 7, 1997	
M1A: Training and Exercises—Prep Issues	Mark Weller Texaco P.O. Box 509 Beacon, NY 12508
M1B: Case Studies—Buffalo Marine 292	Larry Hereth U.S. Coast Guard USCG Gulf Strike Team USCG ATC Mobile, AL 36608-6601
M1C: Response—Edible Oils	Glen Wiltshire U.S. Coast Guard USCG MSO Buffalo 1 Fuhrman Blvd. Buffalo, NY 14203-2395
M1D: Planning—Liability and Compensation	Dan Sheehan U.S. Coast Guard National Pollution Funds Ctr. 4200 Wilson Blvd., Suite 1000 Arlington, VA 22203
II—TUESDAY, APRIL 17, 1997	
T1A: Technology, Research, and Development—Equipment	Chris Gregory Clean Coastal Waters, Inc. 190 South Pico Ave. Long Beach, CA 90802-6247
T1B: Spill Management—Health and Safety	Paul Egner Shell Oil Company Emergency Response, Marine Dept. P.O. Box 2463 Houston, TX 77252-2463
T2A: Technology, Research, and Development— In-Situ Burning	Ann Hayward Walker Scientific and Environmental Assoc., Inc. 4605 H Pinecrest Office Park P.O. Box 11250 Alexandria, VA 22312
T2B: Prevention—Human Factors	Mark vanHaverbeke U.S. Coast Guard Commandant (G-MSE-1) 2100 2nd St., S.W., Room 1304 Washington, DC 20593-0001
T3A: Planning—International	George Jardim Chevron Corporation 555 Market St. San Francisco, CA 94105-2801

T3B: Response—Shorelines

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T3C: Technology, Research, and Development—Oil Properties

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T4A: Perceptions—Media Relations

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T4B: Environmental Effects—Resources at Risk

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T4C: Prevention—Facility Issues

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III—WEDNESDAY, APRIL 9, 1997

W1A: Technology, Research, and Development—CCPs

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W1B: Environmental Effects—Measurements
of Response Success

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W1C: Planning—Regulatory Approach

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W2A: Response—Orimulsion

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W2B: Spill Management—Automated Systems

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W2C: Training and Exercises—Training

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W3A: Prevention—Risk Management

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W3B: Technology, Research, and Development—Modeling

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W3C: Response—Salvage

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W4B: Training and Exercises—Exercises

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W4C: Response—Dispersants

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W4D: Environmental Effects—Net Environment Benefits

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IV—THURSDAY, APRIL 10, 1997

**TH1A: Technology, Research, and Development—
Bioremediation**

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**TH1B: Prevention—Perspectives on Roles
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**TH1C: Spill Management—Response Management
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TH2A: Perceptions—Risk Communication

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TH2B: Case Studies—Heavy Oils

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TH2C: Case Studies—Inland

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TH3A: Case Studies—ISB and Dispersants

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TH3B: Environmental Effects—NRDA

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TH3C: Spill Management—ICS Components

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TH3D: Planning—Joint Planning

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T2: *Sea Empress*/Other Case Studies/Shorelines/Oil Properties

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T4: Chemical Countermeasures/Joint Planning/Regulations

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W1: Automated Systems/Incident Command Systems

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W2: Bioremediation/Modeling/Response Management

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W3: Dispersants/Exercises/Environmental Restoration

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W4: Natural Resource Damage Assessment (NRDA)

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Section I

MONDAY, APRIL 7, 1997

Session M1A: Training and Exercises—Prep Issues

Chairman: Mark Weller
Texaco

Session M1B: Case Studies—Buffalo Marine 292

Chairman: Larry Hereth
U.S. Coast Guard

Session M1C: Response—Edible Oils

Chairman: Glen Wiltshire
U.S. Coast Guard

Session M1D: Planning—Liability and Compensation

Chairman: Dan Sheehan
U.S. Coast Guard

PLANNING AND EXERCISING FOR SUCCESS: THE FOUR-STEP, SCENARIO-BASED PROCESS₁

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ABSTRACT: "No two spills are alike" is an important maxim in oil spill response that requires planners and responders alike to remain adaptable in their thinking regarding response actions. The majority of oil spills are small and can usually be addressed adequately within the confines of a rigid response management system. However, a large spill is not simply a "scaling up" of a routine, small spill. Large spills require input from many more stakeholders, public outrage is intensified, and often difficult decisions on environmental, economic, and emotional tradeoffs are necessary. As a result, a catastrophic spill requires responders to have more than the equipment-focused organizational skills that are satisfactory during routine spills. Complex spills require responders to have advanced interpersonal skills such as team building, risk communication, and organizational problem solving. It is very difficult, however, to evaluate the responder's grasp of these skills and ability to implement them, even though these skills are so critical to the success of a large spill response. The skills that often ensure success for small, frequently occurring spills are not the only skills required for success in a large, complex spill incident.

On the federal level, the area contingency planning process was established to plan for, respond to, and evaluate the adequacy of response capability in a given area. Currently, area contingency plans consist primarily of boiler-plate language, reference materials such as lists of resources, notification procedures, and general incident command system information, all written to satisfy the format required by the guidelines (U.S. Coast Guard, 1992). What is usually missing, however, is a useful discussion by the area committee on how responders might work together to solve problems and on detailed "how to" strategies for preventing a bad situation from getting worse. As a result, the requirement that there be an "assessment of the effectiveness of the plan" (Public Law 101-380, 1990 and 1992) may not be able to take into account an evaluation of the problem-solving and communications skills of the response organization, which is necessary for both the public perception and the reality of a successful complex spill response.

Our objective is to demonstrate how a four-step, scenario-based approach to training, contingency planning, and exercises can improve the response management system's (RMS) performance and ability to succeed. If the area committee is trained with an outward focus on stakeholder needs, develops a scenario-based contingency plan with its stakeholders, and exercises its response organization using these

scenario-based processes, it will improve the effectiveness of a response to a major, complex spill.

During an emergency we want well-trained, experienced, and motivated people to come to our assistance. These people should not only be able to "pass" a drill that evaluates the equipment skills necessary to address a routine, small spill but should also be motivated to look beyond, to the "big picture." If one is having a heart attack, one wants the best-trained people to arrive immediately with the best equipment and the best intentions. One doesn't want someone whose only goal during emergency medical technician training was to simply pass the first-aid skills test. The same applies to an oil spill response. Stakeholders (the heart attack victims) want those who respond to a catastrophic spill to have a goal of "making the environment whole," or restoring whatever was taken away and not simply doing what is necessary to "pass the test." Motivational, professional, and caring skills cannot be as easily evaluated as basic first aid skills, but they are very important to the general public and the stakeholders, whether they be heart attack victims or resource trustees.

The fundamental question is, "How do we train, provide experience, and then evaluate the skills that oil spill responders need for large, complex spills?"

Target audience

This paper was written for a potentially large community: the area committee, made up of federal, state, and local agencies (U.S. Coast Guard, 1992), and those individuals and organizations with a "stake" in an oil spill, whom we call *stakeholders*. Stakeholders can come from many areas of concern and can have a wide range of interests. They can include environmental advocacy groups, property owners with oil on their beach, angry owners with oiled boats, those who feel great concern for oiled birds, the port authority with vessels not allowed to load cargo, a vessel agent for an oiled vessel held at the pier, or the harbor pilots unable to move vessels into or out of the anchorage. This large and varied community participates in the business of doing two things: preventing bad things from happening, and when they happen, preventing them from getting worse. To accomplish this, the members of the area committee and their stakeholders must learn to work together before a complex spill to build a cohesive organization capable of achieving success. Success may have a better chance of realization if responders think

1. The opinions expressed in this paper are solely those of the authors and do not necessarily represent the views of the organizations noted above.

of stakeholders as clients and stakeholders think of responders as equal partners. Each group needs to be successful, and this success is measured differently by the two groups. If both parties realize each other's needs for success and what that success is based on, the group dynamics that develop can be more effective.

The main issue in any organization is performance. When an oil spill response pivots on multijurisdictional collaboration, each performer must be seen as trustworthy. Each performer must have competence (knowledge, skill, and experience) as well as character. Solid character is exhibited when a performer keeps promises, clarifies expectations, listens, is open to feedback, is open and honest, and has integrity that is seen to be firmly in place.

The four-step, scenario-based process outlined here allows the members of the area committee and their stakeholders (most of the same people who will constitute the response management system at the time of a spill) to develop goals and to identify specific tasks that will mitigate the impacts of a complex spill. By working together using this process, the members of the area committee will achieve three important benefits: (1) improved contingency planning efforts and the resulting area contingency plan; (2) better-prepared responders who learn more from their mandated Preparedness for Response Exercise Program (PREP) exercises; and, perhaps most importantly, (3) responders who are better prepared to successfully respond to a large, complex spill.

Problem focus

Emergency response in the United States happens against a backdrop of a democratic society. The demands of a democratic society—such as the public's right to know, stakeholder participation, and open discussion of possible risks and benefits—require extensive communication skills on the part of the response organization. Figure 1 illustrates that as the spill size and complexity increase, the types of skills required of the response organization also change. During routine spills the response organization consists of a small (usually experienced) staff who handles the entire spill. Their prespill training includes practice and performance on all of the response tasks. During a complex spill, however, the larger response management system is required to do more than simply efficiently and effectively clean up the spill because there is increased public awareness and interest. Responders in a response management system must have an expanded perspective on organizational dynamics, group problem solving, and risk communications (Covello, 1996). Instead of an equipment or a narrow task orientation, the responders in the response management system need skills that help the organization resolve conflicts, solve problems, reach consensus on priorities, and skillfully communicate to the public appropriate response expectations (reality). Responders—not only the person in charge—have to view themselves as part of a larger problem-solving process. The area committee is one place where one can start training, planning, and exercising for this type of problem-solving process.

What else is needed?

"Organizations must have the capability to develop into open, flexible organizational systems to manage the more complex events, not just 'ramp up' to a larger size" (Walker *et al.*, 1995). For large or complex events, successful organizations must have the ability to do several tasks at one time (Malcolm Baldrige, 1987). They must have the ability to do the following:

- Identify potential stakeholders and their requirements
- Establish goals, values, and a vision for success
- Measure their ability to communicate with the stakeholders
- Prioritize response actions based on resources and stakeholder needs
- Measure the performance of response actions
- Measure both internal and external achievement of success

These kinds of criteria enable the overall community to participate in the process. The stakeholders can shift as the environment, political and economic, reshapes itself. Time and energy are channeled into an interdependent, contribution-focused organization.

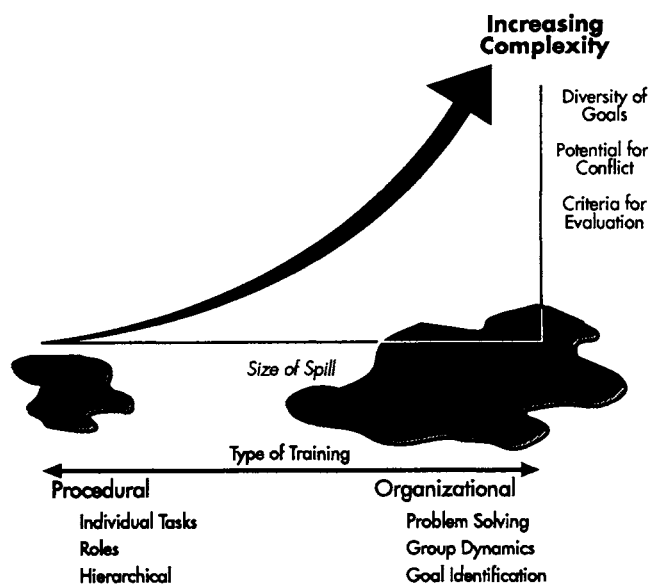


Figure 1. Range of complexity and training needs

This kind of outward focus on stakeholders and their needs is not common in emergency response or in exercise planning. All too often, the inward-looking organization focuses almost exclusively on control systems, equipment, and cleanup. Because of the added dimensions and competing interests during a complex spill, such a limited focus may not ensure success.

If the area committee is trained with an outward focus on stakeholder needs, develops a scenario-based contingency plan with stakeholders, and exercises its response organizations using this scenario-based process, it will improve the effectiveness of a response to a major complex spill because it will be able to address the issues often identified as interfering with a successful spill response. Ideally, planning and exercises should be a way for the area committee to work together with the stakeholders using scenario-based events to improve the chances that a "real" event will be handled successfully. The Coast Guard Port Operations School in Yorktown, Virginia, provides such a scenario-based training for complex spills. The mission of this school is to train and evaluate the Coast Guard pollution responder's ability to recognize problems associated with a large or complex spill ahead of time and to identify proactive measures to prevent the effects of such a spill from worsening. In so doing, responders also learn how to plan prevention strategies that can be included in the area contingency plan.

The four-step process

The following sections of this paper introduce a four-step, scenario-based approach to training, contingency planning, and exercises that can improve area committees' performance and their ability to succeed in their mission to plan for a large, complex spill. This scenario-based process consists of four specific steps: (1) scenario building and problem identification; (2) developing and communicating goals; (3) identifying tasks to prevent problems; and (4) evaluation.

Step 1: Scenario building and problem identification. To begin the process, the participants (members of the area committee and stakeholders) use their knowledge of the port and experiences of spill events to create a series of probable spill scenarios for their port. The participants then prepare a list of potential problems that might result from each of the scenarios. This process is outlined in the recent guidelines for the development of a hazardous substances response annex to the area contingency plan (U.S. Coast Guard, 1996a). It is important that the scenarios be developed by the participants. It is through this type of interactive process that the participants gain experience in defining the system and the causal events that could turn a relatively routine spill into a complex event.

There are several methods that participants can use to build and identify potential problems. Each method helps the participants to work through the entire range of potential problems by grouping them into categories. One method uses the cause-and-effect diagram, a well-known total quality management tool. The Ishikawa or "fishbone" diagram helps to show the relationship of the parts and subparts to the whole by determining factors that cause positive or negative outcomes, focusing on specific issues without resorting to complaints, determining the root causes of a given effect, and identifying areas where there is a lack of data (U.S. Coast Guard, 1993). The diagram is grouped into four major categories of personnel, policy, procedures, and plant and equipment. Some sample problems using these four categories for the cause-and-effect diagram are the following:

Personnel, manpower, or staffing problems

- The response is hampered because of slow mobilization of adequate personnel and equipment.
- The response is hampered because of unskilled management and poor organizational structure.
- The response management system cannot execute its plan or deal with multiple emergencies.
- The cleanup is halted when sufficient HAZWOPER-trained responders cannot be located.
- The response management system is not capable of sustained operations because of lack of relief personnel.

Policy, materials, or regulations problems

- The governor complains that the lack of a preapproved dispersant policy resulted in oiling of sensitive areas and extended the time that the port was closed to commerce.
- Headlines read, "Double Bottoms Would Have Prevented Spill."
- The response management system cannot deal with the media and the public.
- The response management system is accused of not following proper disposal regulations.
- Laborers at the pier bring a lawsuit over alleged health impacts when laborers worked the damaged vessel.

Procedures, methods, or specification problems

- The governor says, "Emergency team slow to respond to community needs."
- The spill impact area is not identified and property owners feel they are being ignored.
- The response management system cannot achieve goal consensus among participants.
- The response management system cannot notify or update appropriate stakeholders on spill progress. Stakeholders feel ignored and angry.
- The response management system cannot decide what to do or how to make decisions.

Plant or machinery problems

- The mayor says, "Damaged vehicle blocks traffic too long."
- Incompatible equipment from multiple oil spill response organizations slows recovery efforts.
- Lightering barge cannot maneuver close to damaged vessel because of shallow water.
- Oil recovery equipment is full and no lightering vessels can be located. No other storage is available to continue recovery efforts.

Another method of capturing potential problems is by categorizing problems by time. The national contingency plan (NCP) (40 CFR Part 300) lists four phases. Examples include the following:

- *Phase I: Discovery and notification.* Critical stakeholders are not notified concerning incident progress.
- *Phase II: Preliminary assessment and initiation of action.* Assessment of the area of spill impact is not completed.
- *Phase III: Containment, countermeasures, cleanup, and disposal.* Daily Press headline reads, "Toxic Vessel Contaminates Port."
- *Phase IV: Documentation and cost recovery.* Vessel owner disclaims the costs of the cleanup effort because of limited documentation.

It's not important what technique is chosen. It is important, though, for the participants to identify the types of problems that concern them in an environment that values their input. Participants work much harder, and with more commitment, on problems they have identified or of which they have ownership. Leaders conducting the process of problem identification must create an environment of trustworthiness by valuing stakeholder issues. The process suggests that issues brought up

by the stakeholders should be written on chart sheets. This use of chart sheets demonstrates recognition and acceptance of an idea. All ideas are important and worthwhile to the success of the overall response if an idea is a valid concern of any stakeholder.

Step 2: Developing and communicating goals. Successfully managing a real spill event depends entirely upon the ability of the response management organization to recognize the goals of stakeholders. The area committee must begin to develop understanding and experience with stakeholder outrage, shared goals, and conflicting goals (Stalfort, 1995). Step 2 of this process allows the participants to develop a list of potential problems and to agree upon goals. With the scenarios from step 1 written and on the table, it is important for the participants to begin step 2 by exploring and understanding the scenario-based goals of each of the stakeholders. A win/win analysis, exploring issues from each point of view with each goal, will bring to light the diverse interests and concerns of stakeholders, build on strengths, and work to complement weaknesses. Commitment will flow from this work to achieve a shared vision. Finally, the group must achieve a consensus on its goals.

Conflict resolution. Stakeholders in the response organization may have different or even conflicting goals as well as their own visions of success. As the spill increases in size or complexity, the opportunities for conflict increase. This step gives the stakeholders experience in working together and resolving conflicts, and this experience will help them during a real spill. The participation of stakeholders in the problem-solving process can demonstrate a sharing of control and accountability that will reduce outrage (Sandman, 1995). Learning about goals and the meaning of success in a low-stress training, planning, or exercise setting will increase the chances for a successful real spill response.

Sample goals. Under each potential problem developed in step 1, the participants list one or more goals associated with, or linked to, the problem. For example, the potential problem—labor at the pier could bring a lawsuit over alleged health impacts—might become connected with the goal "to ensure the health and safety of responders and the community during operations, and to document environmental monitoring and safety procedures." Along with each goal statement would be some way of measuring the accomplishment of the goal. In this example, the health and safety monitoring of workers and the public should occur during response operations. Similarly, the documentation of the health and safety monitoring program should be in the record before any potential lawsuit is filed. Some categories of spill response goals include rescue, secure source, assessment of impact, containment, protection of sensitive areas, recovery of product, disposal, documented safety of workers and the public, notification of stakeholders, and assembling of the response organization (National Strike Force Coordination Center, 1993).

Goals change over time. Just as spill responses change over time, so do the organizational goals and the ways that information is used to make decisions (Stalfort, 1995). In the early stages of an oil spill, the goals include saving lives and stopping the oil spill. These goals may be quite different from the goals during the later stages: removing oil from the beach, protecting sensitive areas, or terminating the cleanup efforts. On many occasions, stages of the spill overlap (Ott *et al.*, 1993). For simplicity, we can depict three stages of a spill: emergency, project management, and investigation.

Goals of the emergency stage. During the emergency stage victims are saved, bodies are removed, and the source of the spill is stopped. There could be many goals. The National Contingency Plan (40 CFR Part 300) suggests three goals: safety, stabilizing the situation, and minimizing environmental damage. The person in charge of the response organization often has to set goals with limited incident information. The traditional, hierarchical leadership model of one person (or a small team) "in charge" during the crisis is typical of the leadership style in this stage. This emergency response phase is not the time to have committee meetings and democratic votes.

Goals of the project management stage. As the spill changes, the initial goals change and the organization must shift to incorporate the goals of additional stakeholders in the evolving organization. The greater the number of stakeholders, the more critical it is that the response management system cooperates and coordinates actions to meet stakeholder goals. The response management system must begin a deliberate attempt to plan for the needs of the stakeholders, meet these needs using the resources of the developing organization, and reevaluate how well the organization is functioning to meet these goals. This requires a management structure that can accommodate emergent organizations and their demands in the process of goal development and consensus building (Walker *et al.*, 1995). In a democratic society, when conflicting

goals cannot be resolved (outside of the emergency stage), people provide information, often technical in nature, at a hearing. The judge, after hearing all the pertinent evidence and information on the issue, renders a decision. An on-scene coordinator (OSC) could use such a decision-making system during the project management phase of the spill to resolve conflicting goals. For the spill scenario, the OSC's decision can be based on both experience and the documentation that is presented by appropriate stakeholders or experts.

Goals of the investigation stage. The investigation of the casualty, the determination of blame, and the calculations of economic and natural resource damages are events that begin soon after the start of the emergency and that may continue for several years. Although there may be interaction between the spill responders and those assigned to investigate the event, there are also often considerable differences in goals, styles, and techniques. The management styles used by those assigned the investigative and report-writing tasks usually remain stable and are separate from the management styles of the newly established response management system.

Step 3: Identifying tasks to prevent problems. Goals establish the operational boundaries for the response organization. Goals become the foundation that defines the functions and tasks that the members of the response organization must undertake during the response. As an incident becomes more complex, the number and variety of tasks increase, as does the need for coordination and support among all the participants if the response is to be successful. One of the primary objectives of this step is to give the participants an alternative way to think during a spill response. Theoretically, oil spill preparedness increases as members of the area committee increase their ability to anticipate problems and take steps to prevent them from developing.

In this step, the area committee members are seated in the traditional incident command system's functional areas of finance, logistics, operations, and planning as spelled out in their area contingency plan. This will help the participants experience how the hypothetical incident command system translates to an actual, complex spill situation and will show the necessary cross-functional relations.

Tasks to prevent problems. To begin this step, an exercise technique developed by Harrauld called "hindcasting" is used. This technique often reminds us of the cliché "Hindsight is 20/20" or "Monday morning quar-

terbacking." Since we can often understand why something failed, we can begin to predict what actions are necessary to prevent the failures from occurring (Harrauld, 1993). Using the hindcast method, members of the area committee begin to explore ways in which the problems identified in step 1 might have been prevented. The participants identify specific tasks that will prevent the problem for each functional area within the response management system, and identify other organizations outside of the response management system that may be impacted by, or dependent upon, their actions.

During this step, participants from these functional areas get out of their incident command system "boxes." They coordinate with other participants and stakeholders, both inside and outside of the response organization, to list the specific tasks that they can perform *together to prevent the problems from developing*. This procedure repeats for all of the problems listed by the stakeholders.

To ensure success, the group must integrate individual tasks that prevent complex spill problems and that help meet the organization's goals. Linking an individual's efforts to the resolution of complex problems seems basic, but it is this kind of management technique and motivational drive that is required for success.

Documenting the tasks. The unique feature of the "task to prevent problems" method is that it provides all the critical data necessary to build an effective, task-oriented, scenario-based area contingency plan. Table 1 is an example that outlines the first pages of the new annex required (U.S. Coast Guard, 1996a) for the area contingency plan. Table 2 contains an example of goals and tasks for the planning functional area. The area committee's development of tasks in this step can be documented in the area contingency plan. The experience of working together to develop goals and tasks that are documented in the area plan can become the foundation for responding to a large complex spill.

Step 4: Evaluation. The entire four-step process falls apart without an effective evaluation. This step is the weakest link in the chain and is therefore the most critical. Without this critical step, how will we know that what we've done is good enough? How will we know when we're done? How will we know that we've succeeded?

This final step evaluates the participants' ability to anticipate problems and to identify and implement actions to prevent those problems from developing (U.S. Coast Guard 1996b). The evaluation criteria

Table 1. Sample oil and hazardous substances area contingency plan

Authority Purpose	OPA 90; CERCLA; COMDTNOTE 16471, dated 24 June 1996 says...
Criteria for implementation of this plan	This plan supplements other state and local emergency planning committees and fire department hazardous materials plans. This plan provides for multijurisdictional command, strategic planning, and integration of resources, etc. Most hazardous materials incidents in the port would be conducted using local resources and emergency plans. However, some hazardous materials incidents may be perceived to be so large, to involve so many jurisdictions, or to be so complex, dangerous, or long-lasting that additional resources or coordination are required. Based on these kinds of criteria, the additional resources of the federal on-scene coordinator (OSC) should be used in support of the local emergency response system.
Scenario development process	The area committee developed and used two scenarios that highlighted the needs of two different port communities. The smaller of the scenarios involved a release of hazardous materials from a vehicle on one of the many bridge/tunnel complexes in the port. The larger scenario involved leaking of hazardous materials on a container vessel. Both of these scenarios are probable, are not now covered in local hazardous materials planning, and potentially involve many jurisdictions.
The area committee considered a number of potential problems that could occur if either of these scenarios were perceived to become large, dangerous, or complex or to involve many jurisdictions in the port. The goals that the area committee identified that would help prevent these potential problems included:	
Goals—bridge/tunnel (B/T) scenario	B/T 1. Clarify leadership roles during a multijurisdictional event B/T 2. Establish communication network of concerned stakeholders B/T 3. Implement short-term health and safety assessment program B/T 4. Implement long-term environmental risk assessment program based on sound scientific and economic principles B/T 5. Identify response resources and shortfalls B/T 6. Learn from experiences and implement changes to process
Goals—container vessel (C/V) scenario	C/V 1. Define responsible and clear description or roles and responsibilities C/V 2. Provide safe haven for vessels with hazardous materials cargo problem C/V 3. Provide for legal, effective, efficient, and safe removal/disposal of damaged product C/V 4. Complete a risk/hazard assessment considering crew, pilots, responders, citizens

below must be applied to steps 1, 2, and 3 to determine whether the participants have improved their ability to work together to succeed in planning for, exercising for, and responding to a complex spill incident. The standards by which the participants are evaluated include the following:

- From step 1, scenario and problem development: The events are realistic and the resulting problems are "significant" and of an appropriate number.
- From step 2, goals: Must include goals for each stage of the response, and the participants must achieve consensus on the list of goals and their priority.
- From step 3, tasks to prevent problems: Must be tied to the causal chain of events, must be feasible, and must include the political and economic consequences of participants' actions as compared to the effectiveness of their actions.

Conclusions

We agree that all parties concerned want the response to a large oil spill to be accomplished as quickly and effectively as possible. Unfortunately, experience has taught us that the dynamics surrounding complex spill events cannot simply be scaled up from those observed in routine, small spills. The diversity of the stakeholders involved, the intensity of public outrage, and the competing spill goals require a level of "flexibility" in a response management system if success is to be possible.

The four-step, scenario-based process provides the area committee and stakeholders one such framework in which these complexities can be addressed and integrated into spill planning and exercises.

The four-step, scenario-based process presented in this paper has many advantages for training, planning, exercise, and prevention because it builds trust through experience, understanding, and consensus. Our objectives are to demonstrate how the scenario-based approach to training, contingency planning, and exercises can improve the area committees' performance during an oil spill exercise and their ability to succeed in response to a complex oil spill. If the area committee members are trained with an outward focus on stakeholder needs, develop a scenario-based contingency plan with their stakeholders, and exercise their response organization using these scenario-based processes, they will improve the effectiveness of a response to a major complex spill. For example:

- The people (stakeholders) who would be the key players during a real emergency are given the experience of working together.
- The participants develop a better understanding of the various definitions of success held by stakeholders as well as how to gauge the performance of the response organization.
- The participants experience the art of negotiating goals, understanding each other's perspectives, and struggling to achieve consensus with one another. The process demonstrates a sharing of control and accountability that will reduce outrage.
- The participants become experienced at recognizing problems and identifying preventative actions to keep these problems from worsening as the spill response progresses.

Table 2. Sample goals and tasks for the planning functional area

Purpose	Understand situation, predict probable course of events, prepare alternative strategies. See Field Operations Guide (U.S. Coast Guard, 1996c).
Goals	Tasks
B/T 1 & C/V 1 leadership roles	Define roles and authorities for the area committee and key stakeholders Develop comprehensive list of possible stakeholders Develop training and exercises on leadership roles, schedule training and exercise opportunities that emphasize roles and chain of command.
B/T 2 communication network	Develop notification checklist for updates and reports Update local government emergency communications centers Train notification staff "how to" make phone calls Plan for internal information flow: status boards, update cycles, incident action plan, incident forms
B/T 3 & C/V 4 short-term assessment	Establish technical support team—"home team" Atlantic Strike Team (AST), Emergency Medical Services (EMS), Regional Response Team, NOAA Scientific Support Coordinator, Manufacture, CHEMTREC, local health department Have research done by technical home team on the risk/threat, review manifest, technical resources, technical experts, including Centers for Disease Control Provide technical support to on-scene teams Establish action levels for the materials involved Develop monitoring/sampling plan Establish on-site "away team" or incident response team (IRT), identify members of fire service, AST, marine chemist, contractor, state emergency services Plan for transition from short-term to long-term assessment
B/T 4 long-term assessment	Add the following to continued efforts noted in B/T 3 above: Develop action plan based on sound science and economic principals for approval of OSC (may lead to administrative order or consent order)
B/T 5 response resources	Plan for participation of natural resource damage assessment and risk assessment teams Schedule meeting of industry and incident response team to discuss consolidation of resource lists Reference current plans, including the LEPC, area contingency plan, state HAZMAT plan, incident response team
B/T 6 learn from experience	Provide opportunities to learn from emergencies Schedule "hot wash" of incident to capture problem areas, develop appropriate goals and tasks Schedule presentation of lessons learned to area committee, state HAZMAT meetings, incident response team, HAZMAT conference Schedule presentation about area committee roles, plans at local HAZMAT conference
C/V 2 Identify safe haven	Develop policy on safe havens/anchorages Develop list of stakeholders' names and phone numbers—including state ports, EMS, Board of Pilots and Navigation, local governments, local EMS
C/V 3 disposal	Develop a list of stakeholders Develop plan to "pick" problem container from vessel, select hatch that would be removed first, and develop action plan if container continues to leak during pick

- Finally, the participants experience the shift in leadership styles as the incident changes from the traditional authoritative leadership style required at the start of the crisis to a more open decision-making style that uses information-gathering and analysis methods.

No matter how good the regulations, enforcement, and planning, there will still be oil spills. We have a great deal of experience with small spills and the management of routine spills that focuses on equipment and resource use. Complex spills, however, require more. The democratic decision-making process may feel cumbersome as participants sort out their anger, frustrations, and needs, often in a public forum. The desire to return to the clean, authoritative decision-making style used during the emergency phase is understandable. However, there is no going back. The four-step scenario planning process gives the participants experience in the complexities of a large oil spill, making the process feel less cumbersome and improving the chances for success. And most importantly, it provides a process for building relationships. This cohesion encourages dynamics that lead to success even when resources are stretched to the limit. It also gives leaders the courage to allow others to help determine what is right.

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NATIONAL PREPAREDNESS FOR RESPONSE EXERCISE PROGRAM (PREP): IMPROVING AREA CONTINGENCY PLANS¹

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ABSTRACT: *The primary goal of the National Preparedness for Response Exercise Program (PREP) is the enhancement of the overall preparedness of the nation to respond to oil spills. A specific objective of the program is improvement of area contingency plans (ACPs). This paper assesses whether the PREP program and its impact through the evaluation process has resulted in improvements to ACPs.*

Six 1995 government-led area exercise evaluation reports were analyzed. Each report was produced by a report development team with representation from the industry and state, local, and federal governments. Additionally, the Incident Specific Preparedness Review report of the response to the Houston area San Jacinto River oil spill in October 1994 was reviewed. Conclusions based on the analysis of these reports are as follows: PREP area exercises have been effective in providing substantial feedback to ACP holders by identifying numerous areas for improvement; PREP area exercises have been effective in making changes to ACPs; and PREP area exercises are effective in producing an evaluation report rich in observations, lessons learned, and recommended actions that are shared worldwide through the Internet in the PREP Lessons Learned System.

PREP program

The National Preparedness for Response Exercise Program (PREP) was developed to establish a workable pollution exercise program that meets the intent of section 4202(a) of the Oil Pollution Act of 1990 (OPA 90). OPA 90 legislation focused on prevention, preparedness, and response. The pollution contingency response plans required by industry and government are designed to prepare for an incident and, in the event of an oil spill, ensure that the response is conducted to minimize damage to public health and the environment. To ensure that these response plans work, an "area exercise" was designed to exercise the government/industry interface for pollution response. An area is defined as the geographic area for which a separate and distinct area contingency plan (ACP) has been prepared. An ACP is a pollution contingency plan prepared by members of federal, state, and local agencies developed to be implemented in conjunction with the National Oil and Hazardous Substances Pollution Contingency Plan (Title 40, Code of Federal Regulations, Part 300) and the Regional Contingency Plan to address removal of a worst case discharge and to mitigate or prevent a substantial threat of such a discharge from a vessel, offshore facility, or onshore facility operating in or near an area designated by the president. In accordance

with Coast Guard policy guidance, all ACPs contain standard contents:

- **Operational administration**
Spill funding procedures: Documentation and cost recovery procedures, on-scene coordinator access to the fund, state access to the fund, damage assessment procedures, lead administrative trustee access to the fund
- **Area assessments**
Area of responsibility, area committee organization, area spill history, strategies, sensitive areas, disposal
- **Summary of area resources**
Equipment, logistics, personnel and information resources, special forces
- **Chemical countermeasures**
Dispersants, chemical agents, and other spill-mitigating substances, devices, or technology
- **Health and safety**
The primary federal regulations are the Occupational Safety and Health Administration (OSHA) standards for hazardous waste operations and emergency response found in 29 CFR 1910.120.
- **Scenario development**
Outlines response to three spill scenarios: a most probable discharge, a maximum most probable discharge, and a worst case discharge
- **Operations**
Emergency notification list, check-off list: Notification of spill incident, initial response, response strategy, containment and cleanup, removal and waste disposal, secure operations, cost recovery/documentation

Seventeen area exercises are conducted nationwide each year. Six are government-led and eleven are industry-led. The Coast Guard commandant (G-MOR) is the overall program manager who gives direction to the scope of the program. Coast Guard district commanders and EPA regional administrators are the exercise directors who ensure that each exercise meets objectives within their area of responsibility. Coast Guard units and EPA responders designated as the federal on-scene coordinators (FOSCs) also contribute by identifying exercise objectives, fostering state and local agency participation, and identifying industry responsible parties (definition as per OPA 90 section 1001) for the exercises. Exercise design is a cooperative effort executed by a joint design team (JDT) composed of representatives from federal, state, and local governments, and industry. The National Strike Force Coordination Center (NSFCC) is the exercise coordinator that facilitates the JDT exercise design, establishes control of the exercise execution, and facilitates the exercise evaluation process.

The six annual PREP government-led exercises concentrate on unified command organizational dynamics (government, state, and industry).

1. The views expressed in this paper are those of the authors and are not to be construed as official or reflecting the views of the commandant or of the U.S. Coast Guard.

try) and its response to a simulated oil spill and/or release of hazardous materials. Each simulation allows the unified command to interact with the response community in a nonthreatening environment. Oil, hazardous materials, or surrogates are not discharged, but exercise participants respond as if it were a real incident by deploying response personnel and limited amounts of equipment. Five exercises are conducted in the coastal areas where the Coast Guard is the designated federal on-scene coordinator. One exercise is conducted in an inland region where the Environmental Protection Agency is the on-scene coordinator.

Exercise evaluation

Each exercise has an evaluation report development team led by the exercise director with representation from industry and state, local, and federal government. The NSFCC provides the raw data for the report development team, which consist of the following:

- Exercise evaluator observations recorded on preprinted forms specific for a unified command element in response to questions identified by the joint design team. An evaluator is a dedicated data collector at the exercise who is recording player actions.
- Comments, lessons learned, and recommendations from a postexercise debrief produced by each unified command element.
- The exercise log: a chronological timeline of events during the exercise.
- Comments from a postexercise evaluator debrief.
- Written comments by any exercise player, controller, evaluator, or observer made on a "Player/Participant Critique Form."
- Previous PREP evaluations reports.

The Coast Guard district commander or EPA regional administrator will review and approve the exercise evaluation report for submission to Coast Guard Headquarters (G-MOR).

Analysis of evaluation reports

This paper focuses on an analysis of the PREP evaluation reports from the six government-led 1995 exercises, with the primary purpose of assessing the recommendations that were made for changes to the area contingency plans.

- Wilmington, North Carolina, February 1995
- San Francisco, California, April 1995
- Cleveland, Ohio, June 1995
- St. Paul, Minnesota, August 1995
- Tampa, Florida, September 1995
- Corpus Christi, Texas, December 1995

The six evaluation reports generally followed a similar format. Five of the six reports listed overall exercise strengths, four of the six listed overall exercise recommendations, and one report provided overall

exercise lessons learned. All of the reports had their most voluminous section devoted to "Exercise Objectives with Evaluators' Comments." The exercise objectives identified by the joint design team were chosen from the list of 16 provided in the "PREP Guidelines" (guidelines are available from the Government Printing Office, GPO Stock #050-012-00365-3). In this section, for each of the objectives selected, there were applicable observations, lessons learned, and recommended actions. Table 1 lists the quantity of these statements by report:

Exercise goals, strengths, and recommendations

Goals. All six reports listed exercise goals. Listed here are those that were most common among all six exercises (the number of reports that shared this common statement is included in parentheses):

- Exercise the national response system (national contingency plan) in a government-led area exercise consistent with PREP guidelines and participant objectives. One report added its area contingency plan and responsible party vessel response plan. (6)
- Conduct an exercise commencing with notifications (length of exercise 1 or 2 days). In conjunction with this goal, four reports included the establishment of an incident command system, one included a news briefing, and one added the development of an incident action plan. Two reports listed as a separate goal the integration of the USCG/EPA, the state, industry hosts, and the local community into an incident command system or response organization. (6)
- Initiate a realistic scenario that will provide participants with an opportunity to enhance skills and evaluate response plans in a non-threatening environment. (6)
- Validate specific response strategies of applicable plans: the ACP or vessel response plans. (6)
- Provide feedback to plan holders by identifying areas of improvement. Generate an evaluation report that provides observations, lessons learned, and recommended actions. (6)
- Stage and deploy equipment. (4)
- Exercise the public affairs portion of the ACP, vessel response plan, and/or state plan. (3)
- Exercise all 16 PREP objectives. (3)
- Incorporate the Coast Guard District Response Group into the response organization. (3)

Strengths. An analysis of the five reports that reported overall exercise strengths revealed the following (the number of reports that shared this common statement is included in parentheses after the statement):

- The unified command worked well, quickly identified initial strategies and objectives, and facilitated the coordination between response groups. (5)
- The area contingency plan proved to be an effective planning document and was used to identify sensitive areas and protective strategies. (4)
- The joint information center was effective and kept the unified command informed. (3)

Table 1. Number of statements listed by report for the six government-led 1995 exercises

Exercise	Executive summary				PREP objectives		
	Strengths	Goals	Recommend	Lesson learned	Observations	Lesson learned	Recommend
Wilmington	8	10	10	9	51	23	25
San Francisco	8	6	25	—	59	58	88
Cleveland	—	9	—	—	59	17	45
St. Paul	7	6	—	—	65	51	50
Tampa	16	9	35	—	23	17	19
Corpus Christi	9	12	9	—	40	42	60
Total	48	52	79	9	297	208	287

— indicates that none were reported.

Recommend = Recommendations or recommended actions.

- State and local representatives were identified and integrated into the response organization. (3)
- The responsible party volunteers were prepared and knowledgeable. (3)
- Preexercise incident command system training facilitated the formation and operation of the response organization. (2)
- Response plans of the responsible party volunteers proved to be effective planning documents and identified sufficient resources under contract for the simulated incident. (2)
- The incident action plan was thoroughly organized; the forms and guidelines of the applicable field operations guide were used. (2)
- Safety was a primary concern during exercise planning and response. (2)
- Situation status boards used by the planning section were well organized and maintained. (2)

Recommendations. Four of the reports provided a total of 79 recommendations as a part of the executive summary (these recommendations are separate from those provided for each selected objective, which are discussed later in this paper). Listed here are those recommendations that were most common for the four exercises (the number of reports that shared this common statement is included at the end in parentheses):

- Develop more effective and efficient means of internal and/or external communications and information flow. Information management systems are critically important and need to be developed. (4)
- Incident command system/unified command system training is needed for all response organization personnel (federal, state, industry). (3)
- Further develop joint information center procedures for inclusion in Annex L to the ACP. (3)
- Unified commanders should organize the incident command system early and ensure that assignments are clear and communicated to all response personnel; this applies especially to the assignment of section chiefs. Post detailed organization charts and placards identifying functional areas within the response organization for quick identification. (3)
- Reformat the ACP to facilitate the easy location of information. (2)
- Establish an effective resource tracking mechanism. (2)
- Conduct exercises focused on single objectives (communications and documentation). (2)
- Integrate local expertise more fully into the response organization. (2)
- Maintain the distinction between the roles of the operations and planning sections to keep operations from assuming planning functions. (2)

Lessons learned and recommended actions for ACPs

The lengthiest section of all six reports lists each selected PREP objective followed with observations, lessons learned, and recommended actions. An analysis of the six reports, including 208 lessons learned and 287 recommended actions, was made for commonalities. This proved difficult because the observations, lessons learned, and recommended actions of each report are specific for that area response community and its area contingency plan. Because a significant emphasis of PREP is on evaluation of the area contingency plan, this paper focused on the lessons learned and recommended actions relative to the ACP. The numbers of identified recommended changes to the ACP were as follows:

Wilmington	5
San Francisco	9
Cleveland	4
St. Paul	4
Tampa	8
Corpus Christi	18
Total	48

After the recommended changes to the ACP were identified, a telephone interview was conducted with each plan holder office (USCG

captain of the port or EPA regional administrator) to determine the status of the recommended actions. Of the 48 recommended changes to the respective six ACPs, all are being actively addressed. The majority of recommendations have resulted in completed changes to the ACP. The remaining recommendations are in the process of being implemented by the area committee process or are being reviewed or analyzed for potential changes to the ACP.

Examples of the lessons learned and recommended changes to ACPs, by objective

Objective 1: Notifications

Lessons learned:

- Notification information (points of contact, date and time) was not recorded by all organizations for evaluation and verification purposes.
- Response organizations should attempt to limit the number of duplicate notifications.
- Local government agencies already have the knowledge and procedures in place to make emergency notifications to local stakeholders.
- Pullout sections of the ACP allow for flexibility and easy use.

Recommended actions to ACP:

- Tab notification lists for easy access.
- Update the ACP with MLC's phone number. Review ACP notification listing quarterly.
- Streamline the notification process in the ACP through agency agreements delegating notification responsibilities and validate all existing notifications.
- Develop a notification process for the ACP that will limit misinformation.
- Include the notification process for local government and stakeholders in the ACP.
- Continue using the Quick Reference Guide and consider similar applications for other sections of the ACP.

Objective 3: Unified command

Lessons learned:

- The design team determined that the Naval Reserve Center was a better location for the PREP exercise (specific location for this area to handle UCS).
- The unified command should allow for time to discuss procedural problems with section chiefs outside of the command briefings. A task-oriented command may not address a procedural problem as long as it gets results.
- In certain responses, a coordinated rather than a unified approach may be the most efficient response at the section level. However, the command level should remain a fully unified entity.
- Section chiefs needed to meet to coordinate activities and resolve cross-sectional issues. Structured meetings between section chiefs are necessary to ensure horizontal information flow.
- Rapidly establishing and disseminating the strategic objectives and response priorities is critical to a successful response.
- Integration of the regional response team into the planning section proved effective. Clear communications are needed between the RRT and the unified command.

Recommended actions to ACP:

- The ACP should emphasize the role of planning and what type of information and results are expected in the first 24 hours of the spill.
- The ACP should emphasize that a concept of ICS is flexibility.
- Ensure that the ACP emphasizes the need for members within ICS elements to recognize the authority of section chiefs, even though they may not be from their organization.
- Include in the ACP provisions for a unified command staff position to ensure that the national interagency incident management sys-

tem (NIIMS) processes are implemented. This individual should have the authority and expertise to enforce the process. Additionally, the individual should be sufficiently distanced from the actual response to focus on the process.

- Consider incorporating a generic list of strategic objectives into the ACP.
- Revise the ACP to define the communication link between the regional response team and the unified command. Define if and how the RRT integrates into the ICS.
- Change the ACP to reflect a second option of using the Naval Reserve Center, depending upon the size of the incident (specific location for this area to handle UCS).

Subobjective 4.1: Operations

Lessons learned:

- The planning cycle should be initiated immediately to ensure coordinated development of tactical operations and strategies.
- Strategies in the ACP provided initial guidance on protection for the area.
- All resources must be identified, mobilized, and deployed as soon as practical. Communication with field resources is critical.
- The CG Marine Safety Office's marine fire-fighting contingency plan is an excellent tool for fire-fighting response within their area of responsibility.

Recommended actions to ACP:

- Preplan response tasks for response contractors identified in ACP.
- Continue to identify shallow water resources and exercise the ACP field site strategies.
- Revise the ACP to designate sites for helicopter response deployment and staging areas for response resources.
- Continue to identify equipment and vessel staging sites for inclusion in the ACP.
- Revise the ACP to include more guidance on conducting response operations during the first operational period and to emphasize containment as an initial concern in the response.

Subobjective 4.2: Planning

Lessons learned:

- Using multiple tracking systems confused the response. Responders must quickly identify the best systems for tracking resources and combine the information into one effective situation display.
- The unified command must recognize that planning will not produce an incident action plan for the first operational period. Planning must focus on future planning to prevent getting drawn into current operations.
- The early integration of the planning and operations sections allowed early assessment and response actions to be orchestrated, minimizing the impact on sensitive areas.

Recommended actions to ACP:

- Ensure that the ACP addresses the need for flexibility to adapt to responsible party response systems.
- Revise the ACP to give guidance on planning during the first operational period.
- To expedite early assessment, consider predesignating "first attack" strategies by region within the ACP.
- Improve job descriptions for technical specialists and their recommended location within the response organization structure I of the Field Operations Guide and ACP (a CG district task).
- Reorganize ACP Annex E (area assessment) to be more user-friendly.

Subobjective 4.5: Public affairs

Lessons learned:

- Public affairs needs to be adequately staffed, organized, and equipped. JIC staff should include "information officers" to collect factual information from the response organization.

- Local concerns need to be addressed early. A press conference should be conducted earlier in the response. It is essential to brief incident commanders before the press conferences.
- There was a perceived lack of uniformity in the JIC resulting from differing philosophies among the participants and incomplete JIC guidance.

Recommended actions to ACP:

- Competent professionals such as PIAT (NSFCC Public Information Assist Team) should develop standardized JIC procedures that could be incorporated into Annex L of the ACP.
- Expand the public affairs portion of the ACP (Annex L) to further discuss the joint information center role and process.
- Develop most frequently asked questions for the unified command for Annex L to the ACP.

Objective 7: Containment

Lessons learned:

- An alternate booming strategy was created and employed to accommodate water depth and sea grass beds, which required some strategies in the ACP to be altered.
- Alternative staging areas must sometimes be found.
- In high current/wind areas in three channels (specific for this area) of the port, boom needs to be located out of the main current stream to be effective.

Recommended actions to ACP:

- Some strategies in the ACP did not address actual conditions encountered at boom sites, such as water depth, tides, sea grass beds, and site accessibility. Alternate strategies that address these conditions should be developed.
- The subarea plan needs descriptions of major unique storm water structures in the metro watersheds. Facility plans need to have similar information for their locales (EPA).
- Include this tactical booming information in the ACP. (The associated lesson learned described specific high wind areas in three channels of the port where boom needs to be located out of the main current stream to be effective.)
- Identify property owners for key staging areas and develop a procedure for indemnifying them.

Objective 9: Protection

Lessons learned:

- The ACP proved valuable in determining protective strategies. Numerous lessons were learned that may improve the protection of these areas.
- If the information in the ACP is not in a usable format, responders will rely on local knowledge and expertise to determine protection strategies.
- The state automated buoy system is a valuable tool for providing data to support trajectory projections.
- Where strategies were ineffective, alternate effective strategies were developed and employed by unified command from individuals' personal knowledge of the area.

Recommended actions to ACP:

- Replace black-and-white sensitive area maps with color maps to match the originals.
- Include historical sites and economically sensitive areas in the ACP.
- Include information on the state automated buoy system in the ACP.
- The subarea plan should define responsibilities for wildlife recovery. Facility plans should also address this topic (EPA).
- Review and amend the ACP protective booming strategies in light of water depth and presence of sea grass beds, and include length of boom required at sites. Agency responsibility for wildlife rescue needs to be addressed.

Objective 10: Disposal**Lessons learned:**

- A comprehensive disposal plan encompassing temporary storage, recycling, transportation, and disposal was developed by the planning section.
- Disposal issues were addressed by different organizations; however, communications of these issues were not passed.
- Time delays occur in developing a disposal plan without adequate information on disposal options.

Recommended actions to ACP:

- Ensure that local capabilities and limitations for disposal are outlined in the ACP and facility response plan.
- A disposal plan, with state preapproval, should be developed and included in the ACP.
- All involved parties to the exercise should review the ACP waste management section. (In the exercise, disposal issues were addressed, but a formal plan was never created.)

Subobjective 11.1: Internal communications**Lessons learned:**

- Information management systems are critical and need to be developed.
- The ACP should provide further guidance on preparation of a communication plan.
- Good information flow between sections is critical to the response.

Recommended actions to ACP:

- The ACP should include communications and information management procedures for the unified command.
- Improve and expand the communication section of the ACP.
- List frequency allocations for local response organizations in the ACP.
- Identify the data needs between various sections (ICS). Develop ACP guidelines for formalized flow of information (IAP, resource request form, forward resource request as order, receipt of resources, operations, logistics, finance, inventory control bar code systems, etc.).

Objective 13.4: Operational/administrative spaces**Lessons learned:**

- Each organization needs break-out space for private meetings.
- In a large incident the large number of responders may overwhelm facilities established for more routine incidents.

Recommended actions to ACP:

- Include planning factors for spaces required for the unified command in the ACP.
- Have a relocation logistics plan in place before any relocation of the unified command.
- The subarea plan should list possible command spaces, such as hotels with many existing phone lines, government buildings, etc. (EPA).

Recommended actions, other than to the ACP

The recommended actions to the ACP represent 17% of the total recommendations. The remaining recommended actions are not easily categorized because they enforce established good practices, are vague or general in tasking organizations to take corrective action, or are vague in specifying what is to be changed.

**Incident-specific preparedness review:
San Jacinto River oil spill**

After certain actual real-life oil spills (not an exercise), the Coast Guard will designate an incident-specific preparedness review (ISPR)

team to review response to the event. An ISPR team's primary mission is not to grade or evaluate response efforts but to study the ACP's implementation, effectiveness, and the extent to which it integrates with vessel and facility response plans and other applicable federal, state, and local contingency plans. The goal is to conduct a thorough assessment of the preparedness process, focusing on an objective review of the response actions as they compare to planning assumptions.

Incident. During the period of October 9–21, 1994, the remnants of Hurricane Rosa brought significant rainfall to the San Jacinto River Basin, causing severe flooding of the waterways in the Houston, Texas, area. The focus of the ISPR that was submitted on July 30, 1996 to Coast Guard Headquarters chief, Office of Marine Safety, Security and Environmental Protection, is the response to the oil spill from the pipelines broken by the flooding. Related to this response and mentioned in the ISPR was the PREP area exercise conducted in Galveston Bay in February 1994. Specific details of the ISPR report that used the PREP lessons learned system (PLLS) format were as follows:

• ISPR #1.6: Area contingency plan

Discussion: A PREP drill was conducted in the area prior to this incident when shortfalls in the ACP were identified. Example: Underutilization of state agencies was recognized during the PREP exercise, and some of the necessary relationships were established prior to the San Jacinto River spill. The command post for this spill was identified during the PREP drill, and this contributed significantly to the success of the response.

Lesson learned: The PREP program of drills and exercises is a valuable and necessary component for achieving and maintaining preparedness for spill response.

Recommended action: Continue with PREP for government agencies and invite potential spill responders to participate as players in government-led drills and exercises.

• ISPR #2.1: Command, control, and communication/incident command systems

Discussion: During PREP drills, it is difficult to anticipate all the issues that will be faced and the agencies that will be involved during a response. Many state and federal supporting agencies do not attend drills because they are not funded or staffed for this activity. This creates a significant disconnection between lead agencies and supporting agencies and compromises the effectiveness of PREP.

Lesson learned: Drills should be designed to test the interaction between lead and support agencies for both state and federal responders. Sensitive or controversial issues should be squarely faced during these drills.

Recommended action: Area committees should ensure that all federal and state support and resource agencies are included in PREP exercises and in formal training events.

PREP lessons learned system (PLLS)

The PREP lessons learned system (PLLS) is a stand-alone Coast Guard computer program that allows users to access and manipulate the information stored in a lessons learned database. This facilitates contingency and exercise after action reporting. It is managed by the Coast Guard commandant (G-MOR) and is designed to run on an IBM or compatible personal computer with DOS 3.2 or higher, and a minimum of 640K of memory.

The PLLS options include adding information to the database, modifying the information in the database, and deleting information from it. The operator can search the database for specific items using the number of the desired lessons learned, keywords, a string of text from narrative descriptions, the fields in the administrative data, or a combination of all of the above.

Accessing PLLS. If one has access to the Internet, the Coast Guard Navigation Information Service (NIS) Web site is <http://www.navcen.uscg.mil>. If one does not have Internet access, one can access the Coast Guard NIS at (703) 313-5910 using a computer with a modem and communications software. The service is free except for the long-distance charges. Communications parameters are as follows: 8 data bits, no parity, 1 stop bit, asynchronous communications with full duplex. The first time the computer connects to the system, the operator will need to answer a few questions to establish an account. If there are



any problems with the technical aspects of connecting to the NIS, call the watchstander at (703) 313-5900.

Conclusions

The following conclusions can be drawn from an analysis of the six government-led 1995 PREP area exercise evaluation reports:

- PREP area exercises have effectively provided substantial feedback to area contingency plan (ACP) holders by identifying numerous areas for improvement.
- PREP area exercises have resulted in improvements to ACPs.
- PREP area exercises are effective in producing an evaluation report rich in observations, lessons learned, and recommended actions that are shared worldwide through the Internet in the PREP lessons learned system.
- The authors' research for this paper shows that the PREP program is the primary mechanism for producing effective improvements to ACPs.

This paper was based on one method of analysis that primarily assesses the subjective, qualitative information that was depicted in the exercise evaluation reports and ISPR. Other methods of analysis and evaluation might result in differing conclusions.

Biography

Michael Kurgan is the chief of the Preparedness Division and the dual deputy of the U.S. Coast Guard National Strike Force Coordination Center in Elizabeth City, North Carolina. Mr. Kurgan has over 25 years of federal service, the majority of which time has been spent in Washington, D.C. Mr. Kurgan was a congressional investigator (U.S. General Accounting Office) from 1975 through 1981. He was also a deputy director for international affairs and nuclear waste management in the U.S. Department of Energy from 1981 through 1989. From 1989 through 1992, Mr. Kurgan served as a division chief in the Office of Federal Facilities Enforcement in the U.S. Environmental Protection Agency. He assumed his current position in 1993. Mr. Kurgan has been an adjunct faculty member at the University of Virginia and Virginia Wesleyan College. He holds a master of public administration degree (1975) from the Maxwell Graduate School of Citizenship and Public Affairs, Syracuse University, and a bachelor of arts degree in political science and international affairs (1974) from Syracuse University.

Dennis Cashman is a civilian environmental protection specialist at the U.S. Coast Guard National Strike Force Coordination Center in Elizabeth City, North Carolina. He is responsible for facilitating the design, execution, and evaluation of government-led PREP exercises. He has over 20 years of experience in marine environmental protection and commercial vessel safety.

FROM TRAINING TO TESTING: DETAILS OF AN AGGRESSIVE DRILL AND EXERCISE PROGRAM

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ABSTRACT: *With 1997 comes a second triennial period of exercises following the implementation of the Oil Pollution Act of 1990 (OPA 90). Exercises should now be performed in more of a testing environment than in a training environment. Aggressive exercises seek to test response plans and spill management teams rather than to provide opportunities for training. Aggressive exercises also require that one learn by taking risks and making mistakes. Consequently, for this aggressive style of drills and exercises to succeed, regulatory authorities must acknowledge risk taking when they are evaluating exercises. Though training will always be a focus, at least in some elements of response exercises, it should become more specific and compartmentalized while the remaining bulk of the response is being tested. Because aggressive exercises require full agency representation, joint exercises should be considered a way of reducing the number of industry-led drills while achieving credit for multiple plan holders.*

Are these things we call response exercises becoming too much like a staged and choreographed production rather than a test of a facility or vessel response plan? Are they a planned event to show the company in the best possible light? Will the huge oil spill response exercise go the way of the dinosaur? These questions, and more, confront the spill response community in the post-OPA 90 world.

To maintain a high level of response readiness, spill drills cannot become staged and executed as a production. Plan holders must now demonstrate the ability to test rather than train response teams. We must demonstrate real rather than simulated capabilities. Response exercises should be planned and executed in the most realistic simulation. Too many times the phrase "if this were a real spill . . ." is being heard during drills. In order to learn in a testing environment, response teams must be allowed to make mistakes. Risk taking and mistake making must be "allowed" to happen. Regulatory agencies, when evaluating these exercises, must also acknowledge this risk-taking element. Drills should be acknowledged as a practice or scrimmage game rather than a make-or-break performance. If we acknowledge that people will perform as they are trained, the time for a transition from training to testing has come.

Training

Training is generally conducted for two reasons: either because of legislative mandate, or because it is good business practice. The first reason normally denotes a reactive posture, whereas the second reason reflects a proactive approach (Table 1). There is consensus on the benefits of a proactive approach to oil spill prevention or response. As we enter the second triennial period of the OPA 90 drill and exercise requirements, more emphasis must be placed on the testing of spill man-

agement and response teams rather than their training. Though continued training will always be a necessity because of turnover of personnel and changes in policies, response exercises should become less rehearsed. Training can be accomplished within the exercise format without diluting the attempt to test particular aspects of the response. Training elements should be identified as such to all participants and evaluators prior to the exercise. To the extent possible, these training elements should be compartmentalized or functionally isolated from the remainder of the response activity. A clear definition of which elements will be conducted as training also gives participants an indication of the expectation placed upon them.

During a recent ARCO exercise in Long Beach, California, training of spill management team personnel was accomplished through a planned element of the exercise, while the balance of the exercise continued in more of a testing mode. It was agreed that the crisis communications component of recent drills had focused on placing a few team members in the "hot seat," firing tough questions at them for 30 minutes, and then conducting a private debrief to give feedback. This was recognized as a very limited learning environment; it also gave an unclear message to other observers as to what was considered a successful performance.

Prior to the Long Beach exercise, a crisis communications consultant was brought into the exercise planning process. A workshop format for crisis communication was proposed. U.S. Coast Guard and California Department of Fish and Game planning representatives were also invited to submit candidates for the workshop.

During the exercise, simulated press conferences were limited to a few questions for each member of the panel. Panel members were videotaped and given immediate feedback and coaching by the consultant during the press conference session. Additional response team members who were identified prior to the exercise were exposed to the training through brief one-on-one interviews. Each participant was provided with coaching and a personal videotape of his or her performance. All participants praised the format of the workshop and deemed this crisis communication training workshop one of the highlights of the exercise. Meanwhile, a full-scale table-top exercise was continuing to unfold during the 2 days that the workshop was conducted.

The goal of training is to learn. Learning still occurs within the testing mode if feedback is timely and honest. To move from training to testing, senior management, response team members, and the evaluators (agency or otherwise) must agree to allow risk taking. It is by risk taking and the willingness to make mistakes that learning is achieved within a testing mode.

Testing

More emphasis must be placed on the testing rather than the training of spill management and response teams. This does not necessarily

Table 1. Reactive versus proactive training approach

Reactive training	Proactive training
Regulatory requirement	Error prevention program
Cost-driven	Quality-driven
Compliance-based curriculum	Needs-based curriculum
Perceived as a mandate	Perceived as elective

Note: Although the expressions in the reactive column do not necessarily carry a negative connotation, proactive training expressions are less constraining.

imply that drills and exercises need to become some new breed of animal. The "testing" of a response plan or team should involve some on-the-spot challenge to the use of the plan or the performance of the team. Exercises that are designed in this way can be termed "aggressive."

ARCO has instituted and practiced an aggressive drill and exercise schedule that focuses on the training and testing of response elements. The current design of drills and exercises is based on the transition from the training of personnel and strategies to the real-world testing of these elements. If industry is to achieve true readiness, more emphasis needs to be placed on real-time, real-world testing of response plans and teams. ARCO exercises in 1996 involved combined table-top and equipment deployment drills that included unannounced, real-time, and real-world components. These included drills in California, Washington, and Alaska.

An aggressive exercise can be characterized by a number of features (Table 2). One easy method of incorporating aggressiveness into an exercise, whether a table-top exercise or a deployment, is to make it spontaneous. The unannounced drill, often a required component under federal or state exercise guidelines, is the ultimate aggressive drill. Although many response groups typically use this technique only during notification exercises, ARCO has performed unannounced components during major full-team and equipment deployment drills. As an example, ARCO performed a full-team mobilization drill in 1996 at the ARCO, Cherry Point Refinery (Ferndale, Washington). Although spill management team members knew the dates of the exercise (a requirement since members are drawn from many elements of ARCO throughout the West Coast and Alaska), the actual time of notification and the scenario were kept confidential within the drill planning group. Extended team members in California awoke by pager at approximately 0400 hours local time. No travel plans, airline flights, hotels, or ground transportation were made prior to the notification callout.

On arrival at the Cherry Point facility, response team members were forced to integrate into an already functioning table-top exercise that was 5 to 6 hours along. New arrivals were given no briefing documents or directions at the time of arrival. Integration into the ongoing response efforts had to be managed on an individual basis within the unified command structure.

Recent ARCO drills have also focused on the real-time deployment of out-of-region or cascable response resources. During the 1996 exercise cycle, deployments of major equipment packages were conducted in California and Washington. In California, ARCO tested the deployment of the newly formed Clean Pacific Alliance, a West Coast

joint venture between Crowley Marine Services and National Response Corporation. Equipment based in Houston, Texas, was mobilized to southern California and deployed in the Long Beach Harbor in response to a simulated storage tank failure.

In a similar real-time test of cascability, ARCO mobilized the resources of Oil Spill Response Limited (OSRL) in Southampton, United Kingdom, in response to a scenario involving a 40,000-barrel release into Puget Sound, Washington. OSRL equipment was placed on aircraft and flown to Seattle, Washington, where it passed through customs and was deployed onto a tank barge. The response barge was then towed north 10 hours to the simulated spill site where containment and recovery equipment were operated.

Although these real-time, real-world, equipment deployment drills are costly, ARCO believes that the benefit of testing these resources greatly outweighs the expense. Greater confidence in the response plan elements and increased credibility in the eyes of regulatory agencies are but a few of the benefits derived from these exercises (Table 3).

Regulatory involvement

Aggressive exercises involve real regulatory and external world players. This is a vital component of any drill objective. It can be said that the contacts and face-to-face involvement between organizations that occur during an exercise are as valuable as the exercise itself. Although this may be the case for some organizations that exercise infrequently, the real interaction of external world players with real-world concerns and objectives is the goal of the aggressive exercise plan. Outreach to greater numbers of community and governmental groups continues to increase the simulated reality of oil spill drills.

The final goal of this involvement is to encourage these outside participants to play the scenario as they would a real event. The experiences that ARCO has had involving outside interest groups within an oil spill response exercise have been without exception positive and educational. Regulatory agencies, resource trustees, property owners, industry groups (commercial fishing, etc.), local municipalities, native American nations, environmental interest groups, and port authorities are just some of the groups that have participated in ARCO exercises. The philosophy should be, "If they would be involved in a real incident, then involve them in the drill." This approach can also be used in areas with little environmental sensitivity, since it is often difficult to drive a multiday exercise scenario if the spread of oil is easily contained in an area with low environmental sensitivity. This type of environment is common within major oil ports. The ARCO exercise in Long Beach, California, was planned using this approach. Driving forces during the exercise scenario involved dealing with major economic impacts to commerce and shipping in the two largest-volume cargo ports in the nation (Los Angeles, Long Beach). More than 45 federal, state, and local agency personnel participated, in addition to over 100 observers.

Response exercises can be solely designed to test the real-world components of an incident. Community response activities, the actions taken by a plan holder to reach out to impacted communities, have become an increasingly complex and intensive function of the spill management team. A test of this community response activity can be performed without a full spill management team exercise. Because the community response team members function more in communication with outside

Table 2. Elements of an aggressive exercise program

Aggressive drills and exercises tend to be:	
Spontaneous	Unannounced drills or drill elements that use little or no prior notification.
Real-time	No false time compression or expansion.
Real-world	Real weather and conditions used when possible; actual equipment deployment. Team members deployed to field locations.
Involved	Real regulatory agency personnel playing themselves; no role playing of external world players.

Table 3. Benefits of an aggressive drill and exercise program

Aggressive drills and exercises lead to:	
•	A greater sense of security in the ability of team members and the usefulness of the plan.
•	A heightened state of preparedness through more realistic experiences.
•	A heightened awareness of the need for a primary focus on prevention. Never want to respond to a real incident.
•	The respect of agency and industry partners. The corresponding identification of agencies as resources. Development of mutual trust.
•	The respect of and acknowledgment by local communities.

parties (not the response management team), there is no need to establish a full response organization. Community response team members can be deployed into the communities and interact with local interest groups, linking these groups to the response organization as they would during a real event.

ARCO conducted a community response exercise in Kodiak, Alaska, this past year that incorporated this type of exercise. Community interest groups in Kodiak were contacted by the exercise planners and informed of the dates of the drill. These groups were asked to "play" themselves, to think of the issues that would be concerns during an actual event. The community response team members were given a list of contacts to "cold-call" on the day of the exercise. An exercise control function was established in Anchorage to drive the scenario and feed information, such as simulated press releases to the field team. The exercise was a success; it tested the community response team members and established personal contact with community leaders and interest groups.

Evaluation and assessment

The final element of an aggressive exercise program involves the evaluation and assessment of the exercise performance. Without an honest and accurate evaluation, there is no solid feedback concerning the lessons learned. Too many drills end with a critique in which each group describes the great opportunity to work together and the great level of teamwork shown by everyone, and so forth. If the goal is to improve on the existing system, then critiques must become more critical. Documentation of the smilingly menial recommendations for change is crucial. These small details are the basis for a cumulative improvement that is significant. All of those little details that each response management section thought would make their job a little more efficient make up that final 10th percentile of a 100% response.

One way to accomplish this type of feedback is to have a more detailed, critical critique involving only the plan holders' response personnel. ARCO commonly plans a joint critique with all players at the end of the exercise. This is then followed the next morning by an internal evaluation. The response team members are commonly their own worst critics. It is in these sessions that the real "nuts and bolts" suggestions are recorded and actions items are assigned before the next response drill. Training items to be covered prior to the next scheduled exercise are also identified as a result of this second evaluation.

To promote a testing mode for exercises, regulatory agencies must in turn evaluate aggressive exercises. The regulatory evaluation process must further evolve to ensure that exercises are considered as to their overall merit, not merely as they relate to some idealized "optimal" standard. Evaluation and "credit" for drills must be based not only on performance but also on the degree of risk or aggressiveness undertaken by the sponsor. The goal of the evaluation should reflect the continuous improvement process, rather than a simple credit/no credit grading system. Clearly, a realistic, unannounced exercise should be evaluated differently than the final run of one that is prepared and rehearsed.

Conclusions

Why do we drill? We drill and exercise because it is both required and because it is good practice. The core principle is that people will respond in a real situation the same way they respond in an exercise. This is why we need to move from training to testing of response plans and spill management teams. Without the testing of response systems, the core

principle becomes, "We think people will respond the same way in a real situation as they do in an exercise." If the exercise is not realistic in nature, at least in some elements, the feedback is missing.

With this in mind, it becomes increasingly important that we strive to exercise with the highest degree of realism possible. One area that continues to be artificial is the participation of regulatory agency personnel in industry exercises. Some agencies as a policy do not support industry-led exercises. This artificiality forces plan holders to "guess" about the interactions and issues that would be present in a real event. Further, some agencies provide valuable input or services during a real incident, yet force the plan holder to develop parallel systems to meet the very same needs in the drill and exercise environment.

It must be acknowledged that most regulatory agencies are committed to supporting the large number of industry-led exercises being conducted to meet the National Preparedness for Response Exercise Program (PREP) guidelines. Given the number of drills being conducted by industry, regulatory agencies simply cannot provide a consistent level of support to ensure realistic exercise play. Efforts must be made to incorporate a system that allows multiple response plans to be exercised and evaluated in a joint exercise plan. This ability to conduct joint exercises involving multiple responsible parties will provide many benefits to both industry and the regulatory community.

Joint exercises will enable us to reach a more "standardized" response management system. The joint exercise environment will foster consistency that will benefit the entire response community, particularly those who find themselves responding to spills and drills on behalf of multiple plan holders. This will be of particular benefit to regulatory agency personnel who respond to all spills and drills. Plan holders will benefit from lessons learned by others. Regulators and evaluators will in turn benefit from fewer individual exercises. Cost sharing by plan holders for exercise planning and execution will encourage attempts to conduct more aggressive and realistic exercises. Exercise elements such as real-time, on-water deployment of equipment, particularly out-of-region resources, will be more realistic. Equipment deployments in support of a smaller number of events and to the benefit of a larger number of plan holders can become more extensive. The remaining hurdle in achieving these joint exercises is to develop a method of granting credit to the multiple plan holders.

We must also move toward a more critical yet constructive feedback format following these exercise events. Trust is one element that is still not fully developed with regard to the unified command concept as it is applied throughout the response structure. Regulatory agency personnel must trust industry to be responsive, while industry must trust regulatory agencies to drill the same way they will respond. It is within the atmosphere of mutual trust that true and constructive criticism can occur. It is at this point that we become a truly unified response system and can share expertise and capability among industry and agencies rather than between industry and agencies.

Biography

Barry McFarland has been involved in the emergency response to oil and hazardous materials spills for over 5 years. He has responded to spills throughout the United States from within both the public and private sector. His experience includes training and spill response for numerous federal, state, and local agencies. In addition, Barry served as operations manager for a major West Coast spill response contractor. Recently, Barry has provided emergency response consulting, training, and exercise planning to many marine facilities and transportation companies. He is currently the emergency response advisor for ARCO Marine, Inc., which operates a fleet of 10 U.S. flagged tankers.

TANK BARGE *BUFFALO 292*: A UNIFIED RESPONSE

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ABSTRACT: *Buffalo 292 was a 275-foot bunker barge loaded with 17,000 barrels of IFO 380. On March 18, 1996, Buffalo 292 was heading southbound along the Houston Ship Channel. High winds, rough seas, and the barge's loading condition caused the barge to buckle and spill 3000 barrels of product into Galveston Bay. Operational success was linked to the training and experience of the responding agencies, local government assistance, rapid assessment team operations, and the dedicated efforts of the planning section. Responding agencies demonstrated that a unified response is the only way to cope with an environmental disaster of this magnitude.*

Incident overview

At 1320 hours on March 18, 1996, the tug *San Gabriel* was pushing the tank barge *Buffalo 292* southbound along the Houston Ship Channel (Figure 1). *Buffalo 292* was loaded with 17,000 barrels of IFO 380. During the southbound transit, the weather included winds gusting to 45 knots and seas of 4 to 6 feet. While attempting to negotiate a left turn eastbound into the Gulf Intracoastal Waterway, *Buffalo 292* suffered a catastrophic structural failure athwartships in the no. 3 port and starboard cargo tanks. Approximately 3000 barrels of IFO 380 eventually spilled into Galveston Bay and the Gulf of Mexico.

An incident command post was quickly established at Marine Safety Unit Galveston. In addition to the Coast Guard, the National Oceanographic and Atmospheric Administration (NOAA), the U.S. Fish and Wildlife Service (USF&WS), and the U.S. Navy Supervisor of Salvage (Navy SUPSALV) also responded with personnel and resources. The Texas General Land Office (TGLO) provided personnel to the incident command post as well as field response personnel. Other assisting state agencies included the Texas Parks and Wildlife Department (TP&W) and the Texas Natural Resource Conservation Commission (TNRCC).

With the arrival of state personnel, an incident command system with unified command was established, with the Coast Guard fulfilling the role of federal on-scene coordinator (FOSC), the Texas General Land Office the role of state on-scene coordinator (SOSC), and *Buffalo Marine*, via its spill management team, Maritime Response Syndicate, the role of the responsible party on-scene coordinator (RP-OSC) (Figure 2).

Two other important additions to the unified command were representatives from the city and county of Galveston, Texas. These personnel ensured that the needs of their respective communities were addressed in a timely fashion. This was very important because the spill occurred the week before the spring break holiday period, a time of substantial economic benefit to the Galveston area.

Following an overflight by Air Station Houston, the size and scope of the spill were assessed rapidly and initial response plans were quickly implemented. Upon the request of the FOSC, Air Station Corpus Christi provided overflights using its AIREYE-equipped Falcon jets. These overflights enabled response personnel to more effectively track the movement of oil throughout the duration of the spill, especially in the offshore areas.

Contractors were directed to use the Galveston Bay Area contingency plan to determine locations where they could begin placing protective, deflative, and containment booms along several environmentally sensitive and historically significant areas near the spill site. Environmentally sensitive areas were boomed within 24 hours, minimizing shoreline impact. During the height of operations, over 180,000 feet of hard boom, sorbent boom, and viscous sweep was used to assist in mitigating the spill.

A fleet of skimmers, at one time numbering more than 20, was employed to recover oil from Bolivar Roads, the Galveston jetties, and offshore. Effective offshore recovery operations were enhanced through the use of a hand-held infrared camera on board one of the large offshore skimmers. This camera facilitated recovery of oil at night, thus keeping the skimmers employed 24 hours a day.

A barge lightering and salvage plan was simultaneously developed to minimize the potential for more oil to enter the environment, as well as to move the severely damaged barge to a repair facility as soon as possible.

On the second day of operations, the incident command post was moved from MSU Galveston to a local hotel. Response operations were directed from this location until April 4. On April 3, an incident command post was activated by Marine Safety Office Corpus Christi to direct cleanup operations when the product from *Buffalo 292* had migrated south to their area of operations.

The success of the overall response can be linked to four key factors. One was the rapid response by the responding agencies, which can be directly attributed to the training and experience of the responders (federal, state, and contractor). Formal training and regular exercises have formed an efficient and effective team out of the various responding agencies in the Houston-Galveston area. The second factor was that local government resources were quickly mobilized to assist with response efforts. This local area knowledge facilitated development of booming strategies, equipment procurement, and establishment of staging areas. Third, the "Houston-grown" rapid assessment teams enhanced information gathering and guaranteed better use of available resources. Finally, the activities of the planning section ensured operational success through accurate and timely situation updates, detailed resource tracking, and development of effective incident action plans. Together, the responding agencies demonstrated