



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

Date: SEP 11 1996

In Reply Refer To: I-96-1 through -5

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In mid-October 1994, serious flooding occurred in the San Jacinto River flood plain near Houston, Texas, forcing over 14,000 people to evacuate and resulting in 20 deaths. Due to the flooding, eight pipelines ruptured and many others were undermined. More than 35,000 barrels of petroleum and petroleum products were released into the river. Ignition of the released products resulted in 547 people receiving (mostly minor) burn and inhalation injuries. Spill response costs exceeded \$7 million, and estimated property damage losses were about \$16 million.

The National Transportation Safety Board undertook a special investigation<sup>1</sup> to assess: (1) the adequacy of Federal and industry standards on designing pipelines in flood plains, (2) the preparedness of pipeline operators to respond to threats to their pipelines from flooding and to minimize the potential for product releases, and (3) the preparedness of the Nation to minimize the consequences of petroleum releases. The investigation report also addressed the need for effective operational monitoring of pipelines and for the use of remote- or automatic-operated valves to allow for prompt detection of product releases and rapid shutdown of failed pipe segments. The Safety Board made nine safety recommendations — one to the Research and Special Programs Administration, five to the National Response Team (NRT), and one each to the American Petroleum Institute, the Association of Oil Pipe Lines, and the Interstate Natural Gas Association of America.

The response by local, State, and Federal government agencies to the flood emergency was well-managed and effective. The Harris County Sheriff's Department quickly and

<sup>1</sup>For further information, read Special Investigation Report—*Evaluation of Pipeline Failures During Flooding and of Spill Response Actions, San Jacinto River Near Houston, Texas, October 1994* (NTSB/SIR-96/04).

effectively coordinated the available resources. The early activation of an Incident Command System, as well as the previously conducted drills of the Harris County Disaster Plan, greatly assisted the Incident Commander in maintaining effective management of both local and Federal agencies responding to the flood and the gasoline fire. The success of these efforts was supported by the dedication of the responders, who worked tirelessly around the clock responding to human needs.

Overall, the pipeline spill response efforts undertaken were quite effective, due in large part to interagency coordination in both planning and implementing actions. When petroleum products spilled onto the flood waters from ruptured pipelines in the Environmental Protection Agency's (EPA's) assigned inland area of responsibility and flowed into areas in the U.S. Coast Guard's (Coast Guard's) assigned coastal zone of responsibility, the two agencies promptly and harmoniously resolved a potentially contentious issue on overall command of the environmental cleanup response. The two agencies' operations continued to be mutually supportive throughout the remainder of the response.

Federal, State, and local agencies and their contractors apparently worked effectively among themselves and with the pipeline operators and other private interests in responding to the pipeline failures and product spills. Improvements were needed in some areas, however, as noted by the Federal On-Scene Coordinator (FOSC) in his March 9, 1995, memorandum critiquing the response. Among the areas noted by the FOSC as requiring improvement were communications, uniformity in incident command systems used by Coast Guard units, personnel training, fatigue countermeasures, and command and control of operations.

Communication between responders was deficient in a number of instances with respect to this accident. For example, the supervisor of the Division I spill response operations, who was located remote from the unified command center, was not aware of many activities occurring in his area of responsibility because he was not kept informed of decisions made by command officials. He was not aware that a team had been assigned to deploy booms in the sector of a new channel in his area, nor was he aware of the plan for installing fire booms and enhancing the in-situ burn in his area. For the Division I supervisor to have carried out his assigned mission successfully, he should have been fully informed of such activities.

Shortcomings were also experienced during the in-situ burn decisionmaking and implementation processes. At the time the FOSC approved the Burn Enhancement Proposal, he did not consider that what was being proposed was technically an in-situ burning. In fact, the proposal was for performing an in-situ burn, but it contained few of the features required to ensure safety during in-situ burning. The FOSC, as well as the Texas General Land Office (TGLO) representative who approved the burn, should have recognized that to carry out the proposal safely, it was first necessary to:

- Perform several risk assessments for downwind plume monitoring;
- Prepare a detailed safety plan, describing the steps to be taken for protecting the personnel igniting and controlling the burn;

- Put adequate communication procedures in place to minimize the opportunity for incorrect or inappropriate actions; and,
- Notify area fire and police agencies in a timely fashion before conducting the in-situ burn.

Had they taken these steps, the FOSC and the TGLO representative would have learned that much of the research and planning work necessary for approving an in-situ burning had already been completed. A proper review should have quickly identified that the proposal was not consistent with the actual conditions because there were three, not one, pipelines releasing products into the water, and because three different products — diesel fuel and gasoline, as well as crude oil — would be involved. Also, a review of the proposal should have speedily revealed that the hazards posed would be significantly different from previously conducted burns because of the site environment (onshore and residential) and because more volatile material (gasoline) would be involved. All of these differences should have been flags cautioning the FOSC of the need for greater deliberation.

Reasonable forethought did not necessarily have to have been a source of delay, but it should have provided responders with sufficient input to properly consider the proposal, to establish adequate controls to meet all requirements, to provide opportunity to inform affected leadership of the plan, and to provide controls and training on implementation to minimize errors. The FOSC's and the TGLO representative's approval of a proposal that did not contain required safeguards significantly increased the risks to those implementing the plan, as well as to the response personnel and the public. Additionally, the approvals did not comply with several requirements of the Regional Response Team's operational procedures for conducting in-situ controlled burns.

In hindsight, the in-situ burn was likely the most effective remedy measure that could have been undertaken. However, the risks to workers and the public were increased significantly when the unified command conducted an in-situ burn without having in place appropriate checks and balances to ensure that approved procedures and requirements were followed explicitly.

The work environment in a spill response situation calls for the most effective command and control procedures to guard against errors that may endanger responders and the public. Such environments are especially demanding due to the numbers of people and separate agencies and companies involved, the many hours worked each day by responders, and the constant risks faced by responders. These factors substantially increase the opportunity for human error by fatigued workers who have worked several days without adequate rest periods. The Safety Board agrees with the FOSC that a single incident command management process should be used to ensure that all response personnel clearly understand the command structure and control functions.

Based on the FOSC's findings in the critique following the San Jacinto accident, the Safety Board concluded that spill management personnel responding from other regions of the country and trained on different incident command procedures created communications,

command, and control difficulties because they were not familiar with the incident command structure and procedures in use in the Galveston Bay area.

The issues of command and control, uniform incident command structure, and responder training were raised following the March 1989 accident involving the EXXON VALDEZ releasing oil after striking a reef in Prince William Sound, Alaska.<sup>2</sup> Since that time, the NRT has been working to improve these and other areas identified as requiring improvement. In June 1996, the NRT issued its Technical Assistance Document *Incident Command System/Unified Command*. This document provides guidance on responding to spills, regardless of the spill source or the transportation mode. The purpose of this document is:

...to educate all responders of the National Response System to the organizational management concept of Unified Command as it fits within the Incident Command System for emergency response. Unified Command is a necessary tool for effectively managing multi-jurisdictional responses to oil spills or hazardous substance releases.

The NRT has stated that it hopes this document will increase awareness, improve integration and training, help develop a common language and response culture, and help achieve consistent, effective, and efficient response among National Response System members. The Safety Board agrees with the NRT's objectives and considers that the technical document will enhance overall response preparedness.

The NRT is in a uniquely advantageous position to foster achievement of the stated objectives for all spill responders. The NRT may encourage the Coast Guard and the EPA to integrate into their procedures and training of response personnel the command and control principles of the technical document and provide training to all of their personnel who may occupy management positions during a response. Implementation of the unified incident command structure and operational principles in the NRT's Technical Assistance Document *Incident Command System/Unified Command* will enhance the overall preparedness for responding to petroleum spills.

The Safety Board strongly believes in the value of conducting a critique of response activities following an environmental response event. In this instance, neither the FOSC's nor the joint Coast Guard/Research and Special Programs Administration's after-action critiques were comprehensive or complete because they did not include all responding agencies and interests, nor did several key Coast Guard management personnel participate. These lapses prevented the after-action critiques from addressing and providing insight about the significant command and control deficiencies experienced during this incident. Among the deficiencies not identified by the critiques were communication problems experienced in the Operations and Planning Sections — essential units under the FOSC's command for effectively managing the spill response.

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<sup>2</sup> Marine Accident Report—*Grounding of U.S. Tankship EXXON VALDEZ on Bligh Reef, Prince William Sound Near Valdez, Alaska, March 24, 1989* (NTSB/MAR-90/04).

Had the after-action critiques included all agencies participating in the unified command and all personnel functioning as managers, these reports could have made known to the Coast Guard Commandant and the NRT the experiences and views of all participating agencies and organizations on actions that could have enhanced the response effectiveness. Overall critiques of the operation should have identified Harris County's and potentially other agencies' support for improving communications among participating parties, thereby strengthening the FOSC's recommendation to the Coast Guard on communication improvements. Also, critiques should have provided opportunity for the FOSC, the EPA On-Scene Coordinator (OSC), and the other response participants to have learned and understood the circumstances leading to the in-situ burn, which would have assisted them in identifying specific command and control improvements that, if implemented, could greatly reduce the potential for similar problems in future responses. Some lessons on improving the area's spill response preparedness were not learned primarily because a comprehensive after-action critique was not conducted.

The Safety Board has learned that on September 15, 1994, an amendment to 40 Code of Federal Regulations 300.165 of the National Contingency Plan eliminated the requirement for OSCs to prepare reports for every major pollution incident. Instead, to reduce the "burden placed on OSCs and to avoid redundant paperwork," OSCs are now to prepare a report only if requested by the NRT or the Regional Response Team. The stated rationale for the amendment was that:

The most important information contained in OSC reports – lessons learned in specific responses – is expected to be available from other material prepared by the OSC, including the pollution report and the OSC log book.

The Safety Board agrees that the lessons learned from spill responses are important findings developed from after-action critiques that should be shared with all NRT agencies and reviewed by the NRT to assess the need to modify its procedures and guidance documents. Valuable lessons can be learned from each and every response without respect to response size or complexity. Each response should be assessed by the NRT and its member agencies to help identify improvements in procedures and agency guidance.

Based on all of the foregoing material, the National Transportation Safety Board recommends that the National Response Team:

Make your membership aware of the circumstances and nature of the events in the October 1994 environmental response at Houston, Texas, specifically in regard to the need for coordinating all planning and operational activities prior to conducting in-situ burn countermeasures. (Class II, Priority Action) (I-96-1)

Motivate National Response Team agencies to integrate into their area contingency plans the command and control principles contained in Technical Assistance Document *Incident Command System/Unified Command* and encourage them to train all personnel assigned management responsibilities in those principles. (Class II, Priority Action) (I-96-2)

Include procedures for implementing your Unified Command/Incident Command System that will ensure that all safety-critical operations are coordinated with parties at risk. (Class II, Priority Action) (I-96-3)

Establish guidance calling for Federal On-Scene Coordinators to conduct a comprehensive after-action critique of each spill response to incorporate the observations of all participating agencies to identify improvements needed in equipment, communications procedures, guidance, techniques, and management. (Class II, Priority Action) (I-96-4)

Request that Federal On-Scene Coordinators document and forward to National Response Team headquarters all "lessons learned" developed from after-action critiques for review and implementation nationwide as appropriate. (Class II, Priority Action) (I-96-5)

The Safety Board also issued Safety Recommendation P-96-21 to the Research and Special Programs Administration and Safety Recommendations P-96-22 through -24 to the American Petroleum Institute, the Association of Oil Pipe Lines, and the Interstate Natural Gas Association of America, respectively.

The Safety Board is interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations I-96-1 through -5. If you require additional information, you may call (202) 382-0672.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By:   
Jim Hall  
Chairman