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COVER

U.S. Coast Guard and Minerals Management Service sponsored fire-resistant oil spill containment boom performance test using a non-commercial test boom at the Coast Guard Fire and Safety Test Detachment, Mobile, AL, August 1997. William D. Walton, Photographer.

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REPORT OF THE BURNING OPERATIONS PANEL

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Panel Chair

BACKGROUND

Participants in the Operations Panel included representatives from citizens' groups, petroleum industries, equipment manufacturers, universities, response consultants, oil spill removal organizations (OSROs), and state and federal agencies. The discussion focused on the operational elements of *in situ* burning: what research and development work is needed to enhance *in situ* burn operations. There also was a discussion on the barriers remaining to the successful implementation of *in situ* burning.

The Operations Panel session was divided into two phases. The first phase involved identifying research and development needs within key operational categories:

- Oil characteristics
- Environmental
- Resources
- Deployment

From discussion on these key categories, operational needs emerged.

The second phase involved reviewing illustrations (courtesy of Alan Allen) of a number of *in situ* burn deployment scenarios for inland, upland (on land), shoreline, coastal and offshore environments. This was intended to ensure that no research and development issues were overlooked. In a few cases, new research needs emerged. But, for the most part, the scenarios reinforced the research and development needs identified in the first phase.

The research in the area of *in situ* burn operations since the 1994 Workshop has strengthened the viability of *in situ* burning as an oil spill response tool. Significant advances have occurred in the *in situ* burning preapproval process, training, operational procedures, and equipment. The primary operational concern of community and worker exposure to combustion products has been addressed.

In situ burning has been used as a proven response technology for several inland and upland spills. *In situ* burning is the only viable alternative in many remote locations, where mechanical, dispersant and the no cleanup options are more damaging to the environment. Although the opportunities for using *in situ* burning offshore have been limited, it remains a viable response option. The Operations panel agreed with the Environmental and Health panel that the lack of adequate knowledge by the public and other decision makers is the primary barrier to *in situ* burning utilization.

BURNING OPERATIONS PANEL RECOMMENDATIONS

Operations

Need: Enhance *In Situ* Burn Operations.

Research: Conduct large spill response exercise with real oil burn.
Method of Implementation: Field testing.
Priority: High
Comments: Although much has been learned about *in situ* burning through small scale tests and large scale tank burns, there are certain techniques and tactics which only can be evaluated in an open water response exercise with the actual burning of oil.

Research: Develop techniques for controlling and/or extinguishing burns.
Method of Implementation: Large scale tests and field trials.
Priority: High
Comments: *In situ* burn plans frequently include a provision to quickly terminate a burn due to either safety or environmental concerns. Several methods are frequently proposed for burns contained in a fire-resistant boom. One is to slowly increase the tow speed until the oil passes beneath the boom and is extinguished. A second method calls for the release of one end for the horseshoe shaped boom tow allowing the oil to spread to the point were burning can no longer be sustained. The actual use of these techniques has not been documented. Fire fighting foams are frequently used to control or suppress large flammable liquid fires; however, the use of these foams has not been investigated as a means of controlling an *in situ* burn.

Research: Increase the window of opportunity for *in situ* burning near shore or at the shoreline.
Method of Implementation: Large scale tests and burns of opportunity.
Priority: Medium/High
Comments: The impact of *in situ* burning on beaches in bays or other near shore areas has not been fully investigated. This could include the use of burn pits or pools to remove accumulated oil.

Research: Increase window of opportunity for burning on freshwater and upland burns.
Method of Implementation: Large scale tests and burns of opportunity.
Priority: Medium/High
Comments: Most *in situ* burns have taken place on fresh water or upland (on land). The impact of burning on these environments has not been fully quantified. Information on the impact of fire on vegetation has been developed for wildland fires but not for the fire intensity expected from *in situ* burning of oil.

Research: Determine distances for burn relative to oil slicks and other resources.
Method of Implementation: Analysis and large scale tests.
Priority: Medium/High
Comments: The ability of an *in situ* burn to ignite distant oil slicks has not been fully investigated. This is particularly important when burning near newly discharged "fresh" oil which has a low flash point.

Research: Increase the window of opportunity for *in situ* burning of uncontained or naturally contained oil.
Method of Implementation: Large scale tests and burns of opportunity.
Priority: Medium
Comments: The one most common uses of *in situ* burning to date involves uncontained or naturally contained oil. Uncontained or naturally contained oil could include spills on land (upland), in small bodies of water, in wetlands, or in ice. There is a need for better documentation of actual *in situ* burns. The burning of large uncontained spills on open water has not been extensively studied.

Research: Provide adequate worker safety.
Method of Implementation: Not applicable.
Priority: Further research on this topic is not a priority at this time.
Comments: The issue of worker health and safety has been addressed in the *in situ* burn site safety plan developed by the National Response Team (NRT). Since *in situ* burning may be implemented with fresh oil, a general site safety plan which addresses worker exposure to oil vapors should be used.

Resources and Systems

Need: Develop resources and systems to enhance the use of *in situ* burning.

Research: Continue performance testing of fire-resistant oil spill containment boom.
Method of Implementation: Large scale tests.
Priority: High
Comments: Preliminary testing of fire-resistant booms has provided useful data on boom performance. It also has encouraged further product development by manufacturers. Testing will be necessary to evaluate new and improved fire booms. The ASTM Standard Guide for *In Situ* Burning of Oil Spills On Water: Fire-Resistant Containment Boom is still a draft and final evaluation criteria have not been implemented.

Research: Develop fire-resistant booms for use in rivers.
Method of Implementation: Design and large scale tests.
Priority: Medium/High
Comments: Fire-resistant boom designed for use in open water may not be appropriate for use in flowing rivers. Presently there is no fire-resistant boom specifically designed for use

in swift water. In addition to a fire-resistant river boom, the use of temporary sheet steel deflection/containment "fences" may be advantageous.

Research: Develop application systems for emulsion breakers.
Method of Implementation: Design and operational testing.
Priority: Medium
Comments: In order to be effective, emulsion breakers must be applied uniformly and at the proper dosage. Dispersant application systems may not be appropriate or may require modification to be used with emulsion breakers.

Research: Develop a small scale pre-screening fire performance test for fire boom.
Method of Implementation: Small scale tests.
Priority: Medium
Comments: Prototype fire booms are expensive to test at full scale. The ability to examine new designs with a small scale test may encourage the development of new products.

Research: Enhance the use of fire-resistant boom to protect resources.
Method of Implementation: Design and large scale tests.
Priority: Medium
Comments: One of the potential uses of fire-resistant boom is to keep unintentionally ignited oil burning on water away from people and resources such as piers, docks, vessels and historical sites. The strategy may involve containing or deflecting the burning oil and letting it burn out, or containing the burning oil to increase fire fighting effectiveness. There may be a need to coordinate fire fighting operations with the application of fire-resistant boom used to protect resources.

Research: Develop modular incinerator or burn barge.
Method of Implementation: Design and large scale tests.
Priority: Low
Comments: There have been a number of studies and proposals for the development of incinerator and collection/incinerator barges. The barges are frequently designed to generate less visible smoke than burning in a fire-resistant boom. The benefit of these devices has not been clearly demonstrated since the cost and maintenance are high.

Water-in-oil Emulsions

Need: Increase operational window for burning water-in-oil emulsions.

Research: Cataloging of oils describing the tendency to form water-in-oil emulsions, emulsion burnability and suitability for use with emulsion breakers.
Method of Implementation: The approach should expand existing knowledge of burning water-in-oil emulsions with small scale and possibly large scale tests.
Priority: Medium/High
Comments: This work should include imported as well as North American oils. It may be desirable to include some heavy oils in these studies. Since it is difficult to characterize the oil at the time of a spill, it would be desirable to include oil burn properties (e.g., tendency to form emulsion, emulsion stability, suitable emulsion breakers) as part of the shipping information. Presently there are no emulsion breakers on the National Contingency Plan (NCP) product schedule. The addition of these items to the schedule needs to be addressed.

Research: Develop field kit for assessing the burnability of water-in-oil emulsions.
Method of Implementation: Not determined.
Priority: Low/Medium
Comments: Operating personnel desire a quick pre-burn assessment kit to enable them to determine if a water-in-oil emulsion is burnable. Although collecting a representative oil sample is difficult, a relatively simple test would be extremely valuable.

Research: Assess the effect of dispersants on *in situ* burning, particularly the use of dispersants on water-in-oil emulsions.
Method of Implementation: Laboratory and large scale experiments.
Priority: Low
Comments: Dispersants may serve as emulsion breakers in some cases but the impact on burning has not been assessed. Responders may consider burning the oil remaining after dispersants have been applied. They also may consider applying dispersants to the residue remaining after burning. The effect of dispersants has not been examined for these cases.

Research: Determine the effect of emulsion breakers or dispersants on *in situ* burn emissions.
Method of Implementation: Laboratory and large scale tests.
Priority: Low
Comments: The addition of chemicals to the spill may change the smoke composition during burning.

Environmental Factors

Need: Characterize the influence of environmental factors on *in situ* burning.

Research: Determine the effect of precipitation on burn efficiency.
Method of Implementation: Laboratory and large scale tests.
Priority: Low
Comments: Experience indicates that precipitation does not have a major impact on the burning rate of large oil fires; however, this has not been quantified.

Research: Study effects of debris on burning.
Method of Implementation: Large scale tests.
Priority: Low
Comments: Debris (e.g., vegetation, flotsam) may change the burning characteristics of the spill.

Non-Research and Development Needs

Action: Further develop training programs on *in situ* burning.
Method of Implementation: The panel made the following training recommendations:

- Ensure continued practice in boom operations to maintain proficiency in executing various configurations ("U" and "J") and station-keeping tactics.
- Exercise heli-torch systems with simulated oil spills.
- Structure training programs to include illustrations, photos and hands-on training activities.
- A suggested training curriculum may be structured as follows:
    1. A short (1 hr to 2 hr) introduction of *in situ* burning for management. Include defensive booming for protection from accidental fires.
    2. Hold one day of classroom training with lots of illustrations and photographs for the field responders.
    3. Conduct one to two days of field training including as much hands-on training as possible:
        a. Use of hand-held ignitors
        b. Small pan or bucket oil burning
        c. Boom deployments
        d. Fire suppression

Priority: High
Comments: The panel agreed there was no need for standard qualification of personnel at this time. The training needs to be tailored for different responder types (e.g., incident commanders, field workers).