Contact Information

Oil or Chemical Spill

call the National Response Center at

800-424-8802

Oil Spill Planning

in the Coastal Zone of New England, contact the local U.S. Coast Guard Marine Safety Office (MSO):

MSO Portland
207-780-3251

MSO Boston
617-223-3000

MSO Providence
401-435-2300

MSO Long Island Sound
203-468-4464

In the Inland Zone of New England, contact the Region I office of the U.S. Environmental Protection Agency:
617-223-7265

Suggested References:

Oil in the Sea
National Academy Press 1985

EPA's Oil Program Website
www.epa.gov/oilspill/

Coast Guard's Marine Safety and Environmental Protection Website
www.uscg.mil/hq/g-m/

NOAA HAZMAT Website
response.restoration.noaa.gov

Oil Spill Intelligence Report's Oil Spill Basics: A Primer for Students
www.cutter.com/osir/primer.htm

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OIL SPILL PREVENTION, PLANNING, AND RESPONSE MEASURES

T/B North Cape, South Kingstown, RI, January 1996
Photo: Ed Levine, NOAA

April 1998

Introduction

Nationwide, the safe shipment of oil and adequate preparedness to respond in the event of an oil spill are top priorities for both industry and government. Federal and state agencies from the six New England states have assembled this series of pamphlets to provide an overview of oil spill prevention, planning, and response topics. References are also provided to guide the reader to additional information on oil spill prevention and response.

Some oil facts:

- The United States consumes over 700 million gallons of oil daily, and U.S. oil imports are projected to grow about 2.2% per year through 2001.
- Over half of the oil consumed in the U.S. is imported over sea or land.
- New England ports handle approximately 15 billion gallons of oil annually.

The Oil Pollution Act of 1990

The Oil Pollution Act of 1990 (OPA 90), which was enacted by Congress soon after the *Exxon Valdez* oil spill in 1989, greatly strengthened prevention, planning, response, and restoration efforts. Major provisions of OPA:

- Require vessel and facility owners that handle oil as cargo to develop plans detailing steps they will take to immediately respond to an oil spill. These plans must: document agreements with oil spill cleanup organizations to respond in the event of an oil spill, be approved by the U.S. Coast Guard or U.S. Environmental Protection Agency, and be tested regularly.
- Require new oil carrying tank barges and tank ships operating in U.S. waters to have double hulls, and require existing tankers to be phased out of this service over a 25 year period, based on the age of the vessel.
- Subject spillers to unlimited liability for gross negligence, willful misconduct, violation of any federal operating or safety standard, failure to report a spill, or failure to participate in the cleanup.
- Establish a $1 billion Oil Spill Liability Trust Fund. The fund ensures that legal or monetary issues do not impede timely spill response or reimbursement for damages. Spillers are responsible for costs paid by the fund.
- Require the Coast Guard to study navigational measures to reduce spills.
- Allow states to pass stricter laws than OPA 90, which many have already done.

T/V Julie N, Portland , ME, November 1996

Photo: NOAA

Spill Response

Black oil spewing from a large oil tanker is a powerful symbol of marine pollution and human impact on the natural environment. Significant efforts on the part of government and industry are directed toward preventing oil spills and providing adequate response if prevention measures fail. During a spill, specific priorities and steps are taken to meet the challenges presented.

For most spills the general goals are to:

- Protect the safety of the public and the spill responder.
- Stabilize the source to stop the release of additional oil into the environment.
- Protect sensitive areas to limit the damage caused by the spilled oil.
- Collect and recycle or dispose of oil.
- Rehabilitate wildlife.
- Implement appropriate cleanup strategy for impacted areas.

The response techniques employed in a spill are dependent upon the product spilled, quantity, location, response time, weather conditions, responder capability, and availability of response equipment. First response efforts are improved by pre-identifying resources at risk, protection priorities, available equipment, and response personnel so that the first response is initiated while incident specific priorities are determined. This pre-spill planning is accomplished by the Area Committees that consist of representatives from federal and state governments, with input from industry, academia, environmental groups, and the community. The Area Committees have written Area Contingency Plans that identify response resources, cleanup strategies, and resources at risk within their jurisdiction. These plans also identify the appropriate conditions for the various spill response techniques, including:

- Mechanical containment and recovery
- Dispersants and other chemical countermeasures
- *In-situ* burning
- Shoreline cleanup
- Natural removal

It is important to note that these techniques are not mutually exclusive. To provide the most effective response under the widest range of conditions, oil spill response personnel may use response techniques from multiple categories. The other pamphlets in this series will provide more detailed information on these response techniques as well as other areas of interest concerning oil spill response.

Enforcement and Liability

Penalties from the enforcement of federal and state laws provide another incentive for the maritime community to comply with regulated standards, as sanctions range from letters of warning to criminal prosecution. Similarly, expanded liabilities under OPA 90 are another important factor in leveraging change in the maritime industry and influencing the degree to which affected companies emphasize safety and prevention. The expanded limits of liability that apply to regulated vessels and facilities during an oil spill are completely removed if the spill was a result of gross negligence, willful misconduct, or a violation of federal safety, construction, or operating regulations.

Investigation and Continuous Improvement

Even with the most effective prevention measures in place, accidents will occur. Investigations take place after a spill occurs to find the cause and identify ways to prevent future accidents. Investigations may take several paths including legislative action, public involvement to encourage risk reduction, and regulatory changes.

Spill Planning and Preparedness

Facilities and vessels are required to plan for and conduct response actions if an accident occurs. Trained employees can use the plans and drills to their advantage to help minimize damages in the event of a spill. Additional information on this topic is available in a pamphlet titled "*Oil Spill Response Planning and Spill Roles.*"

Suggested References:

Tank Vessel Regulations
46 CFR, Subchapter D, Parts 30–40

Coast Guard's Marine Safety and Environmental Protection Website
www.uscg.mil/hq/g-m/

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Document prepared by:
Region I
Regional Response Team

Co-chairs:
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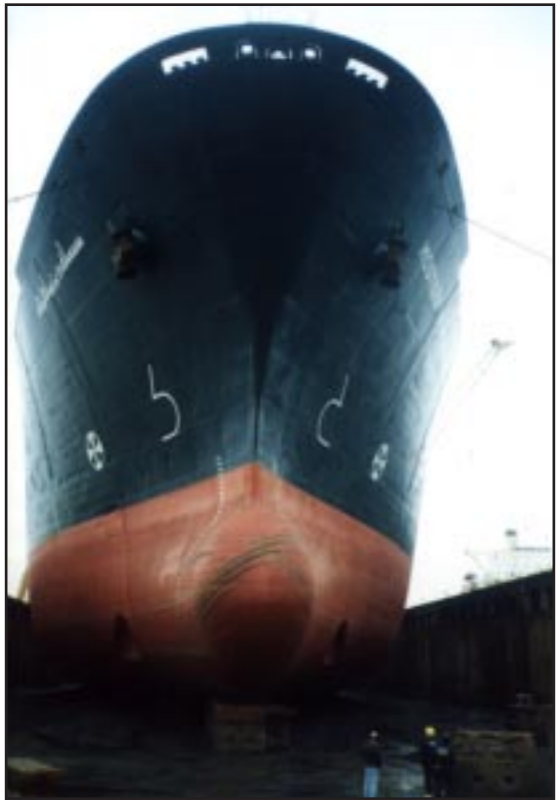
U.S. EPA 617-573-5657

MARINE OIL SPILL PREVENTION



A deep draft vessel in drydock for a hull examination
Photo: USCG

April 1998

Introduction

Prevention of an oil spill is our best option to protect the environment. Federal, state, and local agencies work together with industry to reduce the risk of oil spills. At the federal level, the U. S. Coast Guard (USCG) provides services and oversight of commercial mariners to ensure safe commerce and environmental protection. Legislation, regulation, coordinated field efforts to implement requirements, and education of the maritime public help prevent spills and other maritime accidents.

Vessel and Facility Issues

Federal, state, and local agencies regulate oil handling vessels and facilities. Regulations target vessel and facility construction, maintenance, and operations to reduce the threat of oil spills and other undesirable incidents. National procedural and mechanical requirements help maintain a standard of safety on vessels and at oil handling facilities. Vessels that fly the United States flag must pass regular inspections to keep the documents necessary to sail. However, this is not enough since more than 90% of commercial port calls in U.S. waters are by vessels flying foreign flags. To minimize the threat posed by foreign ships, monitoring is conducted to ensure compliance with international standards and applicable U.S. regulations. Foreign vessels are boarded based on a risk ranking derived from several factors such as:

- flag state,
- classification society,
- owner, and
- vessel history.

The risk posed by foreign vessels that may be substandard is reduced by stepped up U.S. Coast Guard boardings. Also, the Oil Pollution Act of 1990 (OPA 90) required changes in the design of tank ships and tank barges to reduce the threat of oil spills and the volumes spilled when accidents occur. Today, newly constructed vessels that carry oil as cargo are built with double hulls, which provides a void space to eliminate or reduce spillage if an accident occurs. OPA 90 required existing tank vessels to be retrofitted or removed from this service in U.S. waters over a 25-year period, based on the age of the vessel.

A Coast Guard Inspector checks inside a tank vessel
Photo: USCG

Land-based facilities can also be a source of oil discharges into the environment. Similar to vessels, land-based facilities are subject to regulation and periodic inspection by federal, state, and local agencies. Secondary containment is required at land-based facility oil tanks to prevent the spread of oil if a leak occurs.

Prevention Through People

The USCG implemented a new strategic overarching prevention program in 1996, Prevention Through People (PTP). The PTP program was created because most spills and most serious accidents are caused by human error. PTP emphasizes the role of people in preventing casualties and pollution and seeks to implement cultural change across a number of organizations. Keeping the ocean safe requires responsibility and cooperation among all parties. Organization partnerships and outreach are key to the PTP program. The USCG has signed formal safety partnerships with the American Waterways Organization and the American Petroleum Institute. These partnerships allow for a cooperative effort to achieve safe, environmentally sound, and cost effective marine operations through public education and communication, by creating incentives for safe operations, and ensuring open dialogue on key issues.

On-going Safety Initiatives

Recognizing that different segments of the maritime community have different needs, the USCG is working on various initiatives to minimize the potential of an oil spill as the result of maritime transport of petroleum. International efforts with Port State Control (the efforts of nations to reduce risks from foreign vessels) have enhanced the safety of deep draft vessels, including oil tankers. In July of 1998, the USCG will begin enforcing the International Safety Management (ISM) code for tankers. The USCG will not allow ships and companies into U.S. ports if they fail to meet ISM certification standards. For barges, the USCG will encourage the tank barge community to come into voluntary compliance with the American Waterways Operators' Responsible Carrier Program. Implementation of international and regional safety standards will help prevent maritime accidents and ocean oil spills.

ernment, as allowed by the Oil Pollution Act of 1990.

Responsible Party: The spiller, or responsible party, has the primary responsibility to conduct spill cleanup, following the procedures listed in the vessel or facility response plan. The applicable plan provides for resources to respond to a worst case discharge from that vessel or facility. Industry is also required to have authorized and qualified individuals available 24 hours a day to respond to a spill, and to have sufficient funds available to cover the cost of pollution response to the limit of liability for the vessel or facility.

Unified Command: The federal, state, and responsible party lead officials, because they share the goal of performing a rapid and effective spill cleanup, are encouraged to form a "Unified Command" to direct spill response efforts. Unified Command retains the underlying authorities of the federal and state officials, while allowing the three response teams to integrate and follow a joint incident action plan.

Supporting Teams and Special Forces: In addition to defining the lead agencies in spill response, the National Response System also defines the roles of other agencies, such as those with trustee responsibility for natural resources, or those assigned to the National or Regional Response Teams to coordinate the support of those agencies' resources to an FOSC during an incident. The NCP also establishes several special teams with specific capabilities to assist in spill response, including specially trained Strike Teams, a Public Information Assist Team, Scientific Support Coordinators, and an Environmental Response Team.

Suggested References:

National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR Part 300
www.epa.gov/oilspill/lawsregs.htm

Coastal Area Contingency Plans
Available through NTIS
703-487-4650 or www.ntis.gov

National Response Team Website
www.nrt.org

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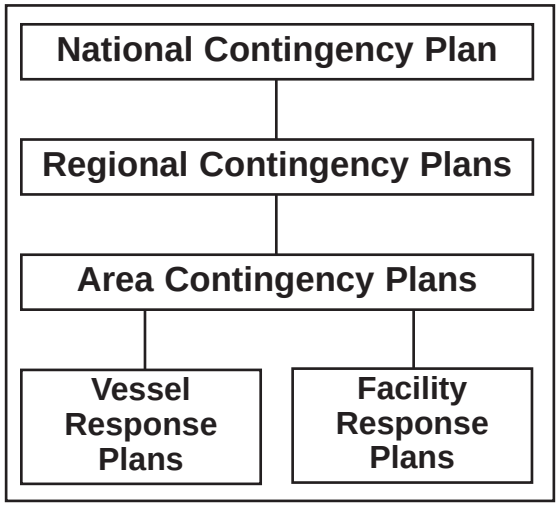
U.S. EPA 617-573-5657

Oil Spill Response Planning and Spill Response Roles



April 1998

Introduction

When prevention efforts fail and an oil spill occurs on the water, spill responders must quickly organize and establish incident-specific priorities to focus on the difficult task of cleaning up the spill. The National Response System ensures coordinated oil spill planning and response efforts by government and industry. Oil pollution cleanup under the National Response System is the responsibility of the polluter, so the System includes requirements to ensure this happens, and the authority and resources to quickly augment or make up for responder inadequacy.

This pamphlet provides an overview of the network of spill response plans and the roles and responsibilities in oil spill cleanup.

Spill Contingency and Response Plans

National Oil and Hazardous Substances Pollution Contingency Plan: Oil spill response planning in the United States is accomplished through a mandated set of interrelated plans. The National Oil and Hazardous Substances Pollution Contingency Plan, commonly referred to as the National Contingency Plan (NCP), provides the broad, national priorities and framework to ensure efficient, coordinated, and effective action to minimize the effects of oil and chemical spills. The NCP is published by the U.S. Environmental Protection Agency (EPA) in consultation with the National Response Team, which consists of 16 federal agencies with interests in various aspects of emergency response to pollution incidents. The NRT is chaired by the EPA and vice-chaired by the U. S. Coast Guard.

Regional Contingency Plans: Ten Regional Contingency Plans, one of which applies to New England, are modeled after the NCP and add information specific to the region; these plans are written by Regional Response Teams (RRTs) whose membership mirrors that of the federal team, but includes all states in the region.

Area Contingency Plans: The next tier of plans is Area Contingency Plans (ACPs), which cover sub-regional geographic areas. The ACPs are a focal point of response planning, providing detailed information on response procedures, priorities, and appropriate countermeasures. ACPs are written by Area Committees assembled from governmental agencies which have pollution response authority; non-governmental participants may attend meetings and provide input. In New England there are four coastal ACPs and one inland ACP. The coastal and inland Area Committees are chaired by the individual (On-Scene Coordinator) from the Coast Guard and the EPA, respectively, who has the lead federal spill response authority for the planning area.

Industry Response Plans: The final tier of plans under the National Response System umbrella for oil spill response are the Vessel Response Plans and Facility Response Plans required of facilities or vessels which handle oil as a cargo in sufficient quantity that could cause substantial harm to the environmental if spilled. These plans detail pollution response action plans for the specific vessel or facility, and must be submitted to the Coast Guard or the EPA for review or approval, depending on the threat to the environment.

Plan Testing and Improvement: The plans of the National Response System are regularly exercised. This ensures that the plan is current and that responsibilities assigned by the plan are tested and understood. Lessons learned from responses and drills are shared nationally, through both publications and an online database, to continually improve plans based on experience.

Spill Roles and Responsibilities

Oil spill responses can involve a large number of organizations due to the potential for widespread and diverse impacts. Government agencies at several levels may have jurisdiction over different aspects of a spill response. To ensure effective coordination, lead agencies have been designated within the National Response System to coordinate or direct spill response efforts. While many spills are small and are cleaned up by the spiller under the supervision of local authorities, the National Response System ensures that state and federal resources are available to ensure adequate cleanup on larger or more complex spills. The following discussion focuses on spill responses that involve federal and state responders.

On-Scene Coordinator: At the federal level, the On-Scene Coordinator (FOSC), is an official from EPA for spills in the inland zone and from the Coast Guard for spills in the coastal zone. The FOSC is the lead federal official for spill response. The FOSC's responsibilities include coordinating all containment, removal, and disposal efforts and resources during an incident, including federal, state, local, and responsible party efforts.

State On-Scene Coordinator: States' agencies also are key players in oil spill response. States have a position similar to the FOSC to coordinate or direct their spill response efforts. State regulations pertaining to spill removal activities may exceed those of the federal gov-

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617-223-7265

Suggested References:

Oil in the Sea
National Academy Press 1985

Mechanical Protection Guidelines
NOAA/HAZMAT and
U.S. Coast Guard 1994

Response to Marine Oil Spills
The International Tanker Owners Pollution Federation, Ltd 1986

EPA's Oil Program Website
www.epa.gov/oilspill/

Coast Guard's Marine Safety and Environmental Protection Website
www.uscg.mil/hq/g-m/

NOAA HAZMAT Website
response.restoration.noaa.gov

Oil Spill Intelligence Report's Oil Spill Basics: A Primer for Students
www.cutter.com/osir/primer.htm

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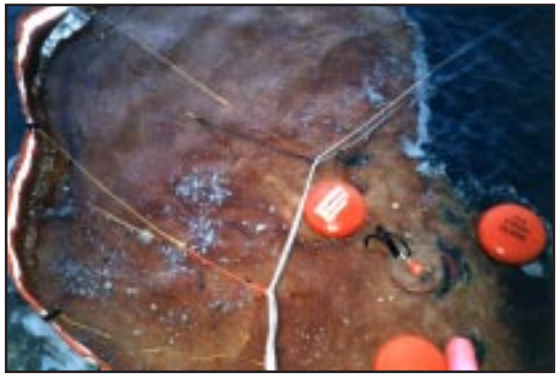
MECHANICAL CONTAINMENT AND RECOVERY OF SPILLED OIL



A skimmer from the U.S. Coast Guard's Vessel of Opportunity Skimming System (VOSS) removes oil contained by the system's boom.
Photo: USCG

April 1998

General Spill Response Considerations

When prevention efforts fail and an oil spill occurs on the water, spill responders face a difficult battle against a dynamic and ever-changing opponent. They have a number of tools at their disposal, depending on the unique aspects of each situation. Among the options available are mechanical cleanup methods, such as containment booms and skimmers, non-mechanical methods, such as dispersants or *in-situ* burning, natural removal, and shoreline cleanup. The selected mix of countermeasures will depend on potential shoreline and natural resource impacts, the size, location, and type of oil spilled, weather, and other variables.

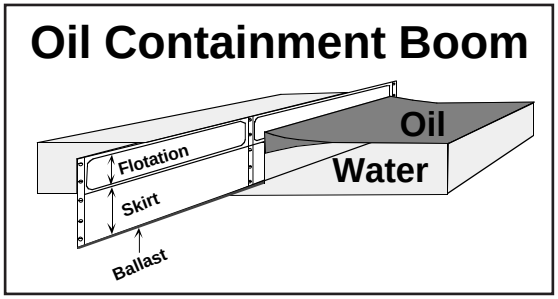
This pamphlet on mechanical spill response is one of a series that provides an overview of oil spill prevention, planning, and response topics.

What Is Mechanical Spill Response?

Mechanical oil spill response uses physical barriers and mechanical devices to redirect and remove oil from the surface of the water. Where feasible and effective, this technique is preferable to other methods, since spilled oil is removed from the environment to be recycled or disposed of at appropriate facilities. Because effective mechanical containment and removal is severely restricted by wind, waves, and currents, only a small percentage of spilled oil has historically been recovered. Mechanical removal of oil utilizes two types of equipment: booms and skimmers.

Oil Containment Booms: Spilled oil floating on the water's surface is affected by wind, currents, and gravity, all of which cause it to spread. This oil may be concentrated or redirected by deploying floating barriers, called booms. Booms come in many different shapes, sizes, and styles. They are used for concentrating oil so that it is thick enough to be skimmed, for keeping oil out of sensitive areas, or for diverting oil into collection areas.

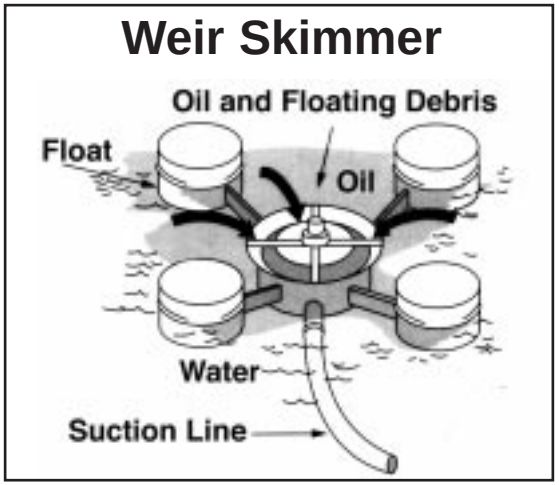
Just like the oil they are trying to corral, the success of booming as a strategy is dependent on currents, wind, and waves. Currents can draw the oil under the booms; waves may cause oil splashover; wind and currents may cause the booms to sink or plane; and currents or debris may damage the boom.



Oil containment boom allows water to pass below the boom skirt while stopping the oil floating on the water.

Skimmers: These devices remove oil from the water's surface and are typically used with booms that concentrate the oil to make it thick enough to be skimmed efficiently. The effectiveness of the skimmer is determined by how quickly it can collect the oil, and how much water is mixed in with it. The oil collected by the skimmer is stored in a containment tank. A wide variety of skimmers is available that use different methods for separating oil from water. Skimmer operating time is limited by the size of the containment tank, and skimmer effectiveness can be hampered by debris.

Vessel-based skimming systems are utilized to remove oil from open water, while vacuum trucks are often used to remove oil that has collected near the shoreline.



In a weir skimmer, oil floating on the surface of the water is pumped into storage after flowing over the skimmer's weir, which is maintained at the oil/water interface.

What Are the Potential Benefits?

- Physically removes oil from the environment.
- Allows recycling or proper disposal of recovered oil.
- Minimizes direct environmental impacts in open water areas.

What Are the Potential Tradeoffs?

- Limitations of mechanical recovery exist. Wind, waves and currents may allow only a fraction of the spilled oil to be contained and recovered.
- Over-reliance on mechanical strategies can be problematic. The limitations of mechanical protection and recovery methods must be fully considered. Booms may fail and skimmers may clog. Responders and response advisors must avoid one dimensional thinking and instead consider the net environmental benefits of all response actions taken.

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Suggested References:

Using Oil Spill Dispersants on the Sea
National Research Council 1989

The Use of Chemicals in Oil Spill Response
American Society of Testing and Materials 1995

Document prepared by:
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DISPERSANTS IN OIL SPILL RESPONSE

A Coast Guard C-130 fitted with a modular dispersant system sprays water in a May 1997 exercise in Oregon
Photo: Scott Lundgren, USCG

April 1998

General Spill Response Considerations

When prevention efforts fail and an oil spill occurs on the water, spill responders face a difficult battle against a dynamic and ever-changing opponent. They have a number of tools at their disposal, depending on the unique aspects of each situation. Among the options available are mechanical cleanup methods, such as containment booms and skimmers, non-mechanical methods, such as dispersants or *in-situ* burning, natural removal, and shoreline cleanup. The selected mix of countermeasures will depend on potential shoreline and natural resource impacts, the size, location, and type of oil spilled, weather, and other variables.

This pamphlet on dispersant use is one of a series that provides an overview of oil spill prevention, planning, and response topics.

What Are Dispersants?

Dispersants are specially designed oil spill products that are composed of detergent-like surfactants in low toxicity solvents. Dispersants do not actually remove oil from the water. Instead, they break the oil slick into small particles, which then disperse into the water where they are further broken down by natural processes. Dispersion of oil into the water column occurs naturally in untreated spills; dispersants just speed up the process. Dispersants also prevent the oil droplets from coming together again and forming another surface slick. Dispersants also reduce the ability of the oil to attach to birds and other animals, shoreline rocks, and vegetation. Fire and explosion hazards are lessened because dispersants reduce evaporation of volatile oil components. The effects of the rapidly diluted dispersed oil must be weighted against the effects of that oil if it were allowed to impact wildlife populations or the shoreline.

Dispersants may be applied to oil from airplanes, helicopters, or vessels. Dispersant spray systems are designed to provide the correct droplet size and dosage, as both are important factors in effective oil dispersal. The volume of dispersant applied is a fraction of the volume of oil treated, with a typical dispersant to oil ratio of 1:20.

Where the Oil Goes

When the oil is treated with dispersants, it initially disperses within approximately the upper 30 feet of the water column. The dispersed oil will be spread horizontally by tides and currents, rapidly decreasing the concentration of the oil. Many impacted water column populations will rapidly recover from the dispersed oil exposure because of their mobility. If these impacts are expected to be short term, these organisms are given a lower priority than bird and mammal populations and sensitive shoreline habitats, which when oiled recover quite slowly. Typically, dispersant use is reserved for deeper waters to ensure sufficient dilution of the oil and to prevent impacts on bottom-dwelling organisms. There may be cases where use in shallower environments can be justified to minimize impact to highly sensitive areas that are difficult to otherwise protect.

Dispersant Effectiveness

Like other spill response techniques, dispersants are not likely to be 100% effective in dispersing surface oil, but may be strategically employed to protect certain areas. Dispersant effectiveness is dependent on the type of oil and environmental conditions.

Approval of Dispersant Use

Because of the tradeoffs involved (i.e., relative benefits and potential negative effects), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) sets limitations on dispersant use. Dispersants must be on a national list maintained by the Environmental Protection Agency. Federal and state agency agreements establish areas where rapid decisions on dispersants may be made by the Federal On-Scene Coordinator. Use outside these areas requires the approval of additional agencies identified in the NCP.

Studies of Dispersants

The evidence from six spills treated with dispersants in United Kingdom waters since 1980 is that dispersion of oil (natural or chemical) into the water column can minimize overall environmental impacts by reducing damage to the shoreline and sea surface ecosystems. The limited environmental damage from the 1993 *Braer* incident, where large volumes of oil were dispersed naturally, provides particularly strong evidence that dispersion of oil can minimize the overall effects of a spill. Chemical dispersion in the *Sea Empress* spill in 1996 was found to reduce environmental damages and cleanup intrusiveness, cost, and duration.

What Are the Potential Benefits?

- Reduced impact of surface oil on shorelines, sensitive habitats, birds, mammals, and other wildlife.
- Rapid treatment of large areas.
- Reduced oil storage and disposal problems.
- Accelerated natural degradation processes.
- Use in high seas and currents is feasible.

What Are the Potential Tradeoffs?

- Increased oil impacts on organisms in the upper 30 feet of water column.
- Time frame for effective use may be short.
- Application equipment may be unavailable.

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Suggested References:

Burning Issues: Is torching the most benign way to clear oil at sea?
Science News 1993 144:220-223

In-Situ Burning of Oil: An alternative approach to spill response
National Response Team, Research and Development Committee 1992

The Science, Technology, and Effects of Controlled Burning of Oil At Sea
Buist, I.A., et al.
Marine Spill Response Corporation
Technical Report Series 94-013 1994

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U.S. EPA 617-573-5657

IN-SITU BURNING IN OIL SPILL RESPONSE

Newfoundland Offshore Burn Experiment, Canada 1993
Photo: David Evans, NIST

April 1998

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This pamphlet on *in-situ* burning is one of a series that provides an overview of oil spill prevention, planning, and response topics.

What Is *In-Situ* Burning?

In-situ burning means the controlled burning of oil "in place." On open water, burning requires specialized fire resistant boom because uncontained oil rapidly spreads too thin to sustain combustion. *In-situ* burning requires less labor than most other techniques and can be applied in areas where other methods can not be used because of limited access to the spill location or ice conditions. Fire-resistant booms are subject to some of the same wind and sea limitations as mechanical removal, since a fire boom behaves much like a standard containment boom. However, burning rapidly removes large quantities of oil and, minimizes the need for recovery and storage.

Where the Oil Goes

The primary products of *in-situ* burning of oil are carbon dioxide and water vapor. About 90% to 95% of the carbon product is released to the atmosphere as carbon dioxide, while particulates commonly account for only about 5% to 10% of the original volume burned. In addition, about half of the particulates are soot, which is responsible for the black appearance of the smoke plume. Minor amounts of gaseous pollutants are emitted, such as carbon monoxide, sulfur dioxide, and nitrogen oxides. In addition, some polynuclear aromatic hydrocarbons (PAHs) are emitted, but the amount released is less than the amount in the original oil.

Field experiments have shown that most air pollutants of concern produced by an *in-situ* burn are concentrated around the area of the fire. Only one pollutant, the fine particles in the smoke, is of concern beyond the immediate area of the fire. These particulates can cause respiratory distress in the elderly or those with impaired lung function if they are inhaled at high levels. Although these small particles from an *in-situ* burn will typically remain suspended and dilute high above the human breathing zone, monitoring plans have been established so responders can monitor particulate levels to ensure the protection of public health.

The decision to use *in-situ* burning must consider the tradeoffs involved, including:

- the impact on air quality,
- the benefit of rapid oil removal
- the safety of the response workers, and
- the risk of secondary fires.

Effectiveness

In-situ burns have typically removed over 90% of the contained oil during experiments and accidental burns of petroleum on water. The small percentage of the original oil volume left unburned is typically a viscous, taffy-like material that floats for a long enough period of time to be manually removed.

Approval of *In-Situ* Burning

Because of the tradeoff decisions involved, certain approvals must be obtained prior to use of *in-situ* burning. Use of burning agents to increase oil combustibility is regulated by Subpart J of the National Contingency Plan. The State Implementation Plans required by the Clean Air Act are the primary plans that regulate air quality and pollutant sources. Agreements between state and federal regulatory authorities establish areas and necessary conditions where rapid decisions on *in-situ* burning may be made by the Federal On-Scene Coordinator and/or the State On-Scene Coordinator(s).

What Are the Potential Benefits?

- Reduces impact of surface oil on shorelines, sensitive habitats, birds, mammals, and other wildlife.
- Rapidly consumes oil in the burn.
- Reduces oil storage and disposal problems.
- Eliminates the air quality impacts of the volatile hydrocarbons that would otherwise evaporate.
- The products of combustion are diluted in the air above and downwind of the burn, dispersing rapidly at ground level to normal concentrations.

What Are the Potential Tradeoffs?

- Use limited to correct atmospheric and sea conditions or offshore areas to protect public health.
- Equipment required for burning may not be readily available.
- Time frame for effective use may be short due to difficulty of igniting weathered oil.

Shoreline Cleanup Methods

Listed below are examples of shoreline cleaning methods. All of the actions are considered carefully before they are approved.

1) Natural Recovery
2) Manual Removal
3) Mechanical Removal
4) Passive Collection with Sorbents
5) Vacuum
6) Debris Removal
7) Sediment Reworking/Tilling
8) Vegetation Cutting/Removal
9) Flooding (deluge)
10) Ambient Water Washing
    -Low Pressure (< 50 psi)
    -High Pressure (< 100 psi)
11) Warm Water Washing (< 90 °F)
12) Hot Water Washing (> 90 °F)
13) Slurry Sand Blasting
14) *Solidifiers*
15) *Shoreline Cleaning Agents*
16) *Nutrient Enrichment*
17) *Burning*

The italics represent methods which require special approvals under federal law.

Suggested References:

Oil in the Sea
National Academy Press 1985

A Field Guide to Coastal Oil Spill Control and Clean-Up Techniques, CONCAWE 1987

Shoreline Cleanup Assessment Manual
NOAA/HAZMAT

Shoreline Countermeasures for Temperate Coastal Environments
(Tropical manual also available)
NOAA/HAZMAT and USCG
Available: NTIS (703) 487-4650

Introduction to Coastal Habitats and Biological Resources for Oil Spill Response
NOAA/HAZMAT

Environmental Effects and Effectiveness of In-Situ Burning in Wetlands
LSU/NOAA

Contact Information

Oil or Chemical Spill

call the National Response Center at
800-424-8802

Oil Spill Planning

in the Coastal Zone of New England, contact the local Coast Guard Marine Safety Office (MSO):

MSO Portland 207-780-3251	MSO Providence 401-435-2300
MSO Boston 617-223-3000	MSO Long Island Sound 203-468-4464

In the Inland Zone of New England, contact the

Region I office of the
U.S. Environmental
Protection Agency:
617-573-5657

Document Prepared by Region I
Regional Response Team

Oil Spill Shoreline Assessment and Shoreline Cleanup

Spill response workers flush an oiled shoreline with water.

April 1998

Shoreline Cleanup

As it is almost impossible to fully prevent shoreline oiling during a spill, how responders approach the cleanup of an oiled shoreline is as important as how they approach the containment and protection priorities. The need for responders and planners to think through cleanup methods in advance of a moving oil slick is critical. Several considerations must be made before a proper cleanup plan can be initiated.

First the type and quantity of the oil that will likely impact the shore must be determined. Oil types vary greatly and have a major influence on the degree of impact, ease of cleanup and persistence of the contamination. For example, lighter fuels (diesel, home heating fuel and light crude oils) will evaporate quickly, but tend to be more toxic and penetrate the shoreline sediments to a greater degree. Heavy oils (bunker C, #6 fuel and heavy crude oils) are less toxic to shoreline ecosystems and do not penetrate finer sediments, but they are very persistent, difficult to clean and may smother shoreline organisms.

Second, the type of shoreline which is predicted to be impacted must be identified and mapped. Both state and federal mapping projects have successfully categorized much of the US shoreline in terms of habitat sensitivity to spilled oil. The most widely used characterization scheme for shorelines is the NOAA Environmental Sensitivity Index (ESI). The ESI ranks shorelines in terms of their relative sensitivity to oil spill impacts, predicted rates of removal of stranded oil by processes such as waves and currents which naturally clean the shoreline, and ease of cleanup.

Shoreline types, from least to most sensitive are:

1. Exposed rocky cliffs & seawalls
2. Wave cut rocky platforms
3. Fine to medium-grained sand beaches
4. Coarse-grained sand beaches
5. Mixed sand and gravel beaches
6. Gravel beaches/Riprap
7. Exposed tidal flats
8. Sheltered rocky shores/man-made structures
9. Sheltered tidal flats
10. Marshes

Once responders have a clear understanding as to the type and degree of impact and the type of shoreline, they can begin planning an effective cleanup strategy. The goal of all the methods discussed is to clean only to the level which would speed recovery and use of the shoreline. Cleaning strategies which will do greater injury to the resource than the oil itself are rejected.

Defining Cleanup Options

Many areas have pre-planned shoreline cleanup methodologies organized in a matrix of oil and shoreline types. Under most circumstances, the process is inclusive of the federal, state and local resource managers. Often non-government organizations such as universities and local non-profit environmental groups are solicited for input. The types of cleanup methods discussed vary from natural recovery to technologies such as surface washing agents and localized burning. The shorelines are discussed by category rather than by location. For example, the planned cleanup options for exposed seawalls might include high pressure washing with ambient sea water during the mid to high tide stages of the tidal cycle. Areas with unique features (e.g., active seal pupping or bird nesting sites) are discussed individually.

One cleanup option commonly used and commonly misunderstood is that of natural recovery. In more sensitive environments (e.g., wetlands, tidal flats, etc.) the activity associated with the cleanup can be more damaging than the oil itself. It is common in these environments for oil to remain on the surface of the sediments. The disturbance caused by an active cleanup will often drive the contaminants below the surface and make them available to the root systems of the plant and the organisms that burrow into the sediments. Responders choose natural recovery in cases where the natural flushing of the tides is the least harmful method of removing the oil, even though the process will be slower than with human intervention.

Mobilizing the Cleanup

Once the cleanup options are defined and agreed upon, responders must determine where cleanup teams should be mobilized. This is determined by the Shoreline Cleanup Assessment Team (SCAT). Individuals experienced in marine sciences and oil spill response walk the impacted shorelines (in some cases it is necessary to use boats or helicopters for the SCAT surveys). These teams catalogue the shoreline in terms of type, degree of oiling, location of specific sensitive resources to be avoided or protected, and other logistical information. The team then recommends cleanup methods for that shoreline area, choosing from the agreed upon cleanup options for that shoreline type. Although this process may seem redundant, it enables the cleanup team to determine the need and priority for cleanup by identifying areas of pooled oil which could re-mobilize and foul other shorelines, deciding on the most appropriate cleanup method for the specific shoreline conditions and noting site-specific constraints in order to minimize further damage during cleanup. In addition, it creates a record of the shoreline impacts which is detailed enough for managers to use in assessing the effectiveness of the cleanup effort.

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Oil Spill Planning

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MSO Portland
207-780-3251

MSO Boston
617-223-3000

MSO Providence
401-435-2300

MSO Long Island Sound
203-468-4464

In the Inland Zone of New England, contact the Region I office of the U.S. Environmental Protection Agency:
617-223-7265

Suggested References:

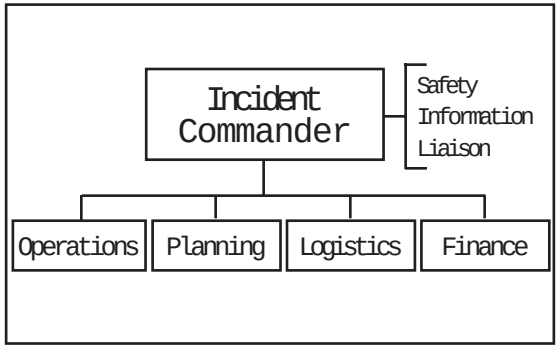
Incident Command System National Training Curriculum: ICS Orientation
National Wildfire Coordinating Group
1994

Incident Command System Forms
U.S. Coast Guard Response Website
www.uscg.mil/hq/g-m/nmc/response/Default.htm#Guides

Document prepared by:
Region I
Regional Response Team

Co-chairs:
U.S. Coast Guard 617-223-8447
U.S. EPA 617-223-7265

INCIDENT COMMAND SYSTEM IN OIL SPILL RESPONSE



April 1998

Introduction

Significant oil spills involve numerous agencies and hundreds, possibly thousands, of people conducting and supporting cleanup efforts. To promote effective and quick coordination during oil spill responses, the Coast Guard and the Environmental Protection Agency use a management system called the Incident Command System (ICS), a part of the National Interagency Incident Management System (NIIMS). ICS provides a comprehensive framework for managing emergency and non-emergency events. Originally created to coordinate firefighting efforts at forest fires, it has been expanded to an all-hazard, all-risk management system. Many applications exist for ICS because of its flexibility, including:

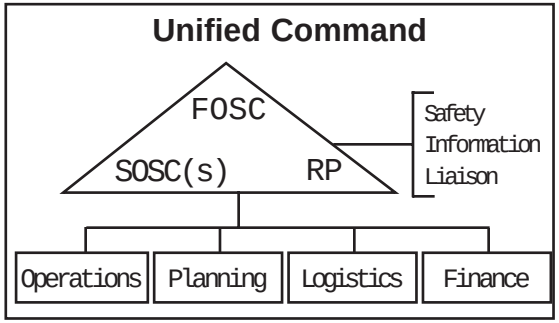
- Oil spill response
- Fires, hazardous material, and multi-casualty incidents
- Multi-jurisdictional and multi-agency disasters
- Wide area search and rescue
- Transportation incidents

Because NIIMS ICS is a public-domain system, training and implementation costs are minimized. Many agencies and companies involved in emergency response have adopted ICS, resulting in improved coordination of response efforts.

Management Activities

The ICS organization is built around five major management activities:

- *Incident Command* sets objectives and priorities, has overall responsibility at the incident or event. Certain functions, such as safety, information, and liaison, are assigned to command staff officers who report directly to the incident command.
- *Operations* conducts tactical operations to carry out an action plan, develops the tactical objectives and organization, and directs all resources.
- *Planning* develops the action plan to accomplish the objectives, collects and evaluates information, tracks resource status, and documents the response effort.
- *Logistics* provides support to meet incident needs, provides resources and all other services needed to support the incident.
- *Finance/Administration* monitors costs related to incident, provides accounting, procurement, time recording, and cost analysis.



Flexibility

The adaptability of ICS stems from the ability to expand or contract the organization as necessary. Small incidents may be managed by one person, the Incident Commander. Large incidents require the functions of ICS to be set up as separate sections, which may be further subdivided. A basic principle that allows the ICS to expand and contract smoothly during an incident is that the person at the top is responsible until the authority is delegated to another person. Span of control is maintained at three to seven employees per supervisor. Smooth shift changes are fostered by established change-of-shift procedures.

Unified Command

In some incidents, including oil spills, there are several organizations that may have shared authority to respond. ICS has the advantage of combining different Federal, State, and Local agencies and the Responsible Party into the same organizational system maximizing coordination of spill response activities and avoiding duplication of efforts. A structure called Unified Command allows the Incident Commander position to be shared among several agencies and organizations that have jurisdiction. In oil spills in the coastal zone, the Unified Command is typically comprised of the Federal On-Scene Coordinator (FOSC), the State On-Scene Coordinator(s) (SOSC), and a Responsible Party representative (RP). This group sets the overall incident objectives and guides and approves the incident action plan. The Unified Command members retain their authority, but work to resolve issues in a cooperative fashion so maximum attention is given to response efforts.

Planned Actions

Every incident has an oral or written incident action plan prepared for each operational period, a period of time chosen based on the nature of the incident, typically a half day, a day, or several days. A suite of ICS forms exists to help prepare the incident action plan.

Training

ICS training and pocket guides help the system run smoothly. A system is provided for the cycle of information gathering, briefings, and implementation.

Summary

Originally developed to fight forest fires, ICS has grown into an incident management system that is widely adopted and used. Because of its flexible nature, low cost of implementation, and widespread use, it is an ideal system for emergency response.