The States/British Columbia Oil Spill Task Force: Going Beyond Response

Jean R. Cameron
States/British Columbia Oil Spill Task Force
811 SW Sixth Avenue, Portland, OR 97204-1390

Abstract

The States/British Columbia Oil Spill Task Force was a reaction to two major West Coast oil spills, the Nestucca and the Exxon Valdez. It has gone beyond reaction, however, to become a proactive force for development and implementation of prevention, preparedness, and response policies and programs by the four U.S. states and one Canadian province which together cover the west coast of North America from Mexico to the Arctic.

Working together over the last five years, the oil spill task force developed and has been implementing more than 90 recommendations to prevent oil spills and improve response. Members have continued to coordinate on various initiatives, the most recent of which is a new Five Year Strategic Plan focusing on development of a prevention program package, more consistent and effective response policies, improved communications among member agencies, and greater public involvement in our efforts.

Introduction

As evidenced by this conference, our collective response to the Exxon Valdez oil spill continues to this day. The States/British Columbia Oil Spill Task Force was also a response to that spill, in part, yet the task force has evolved into a mechanism which goes beyond response—or reaction, if you will—to become a forum for proaction; for proactive development of prevention and preparedness programs; for proactive sharing of data, ideas, and experiences which thereby gives greater leverage to individual jurisdictional efforts; and for a proactive stance on provincial and states’ rights to regulate and respond on behalf of their unique environmental resources. We accomplish all this with a commitment to consensus which is enhanced rather than restricted by our international nature and the diversity of interests among our members and their constituencies.
In explaining how the task force goes beyond response, this paper describes our accomplishments over the last five years and our vision for the next five years as set out in our newly adopted strategic plan.

The First Five Years

The States/British Columbia Oil Spill Task Force actually originated in response to another major spill on the West Coast, one which occurred three days before Christmas 1988, when the tank barge Nestucca broke its towline off the coast of Washington and was subsequently rammed by its tug as it attempted to recapture the barge. Approximately 231,000 gallons of fuel oil were spilled in Washington's coastal waters, eventually contaminating more than 110 miles of Washington and British Columbia coastline, including pristine shores of the Olympic National Park.

That incident prompted Washington Governor Booth Gardner and British Columbia Premier William Van der Zalm to sign a Memorandum of Cooperation creating the States/British Columbia Oil Spill Task Force to coordinate spill prevention and response between those two jurisdictions. Ironically, the day after the first meeting of the new task force three months later was the day that the Exxon Valdez grounded on Bligh Reef, spilling oil that would affect more than 1000 miles of Alaska's coastline. That incident not only prompted Washington and British Columbia to invite Alaska to join the task force, but Oregon and California were drawn in as well as they dealt with issues related to moving the stricken vessel down the Pacific coast for repairs.

The oil spill task force was subsequently formalized in its present form by a Memorandum of Agreement signed by the governors and premier in 1989, who have designated their lead state spill prevention and response agencies to represent them to the task force. Currently, these task force member agencies are:

- British Columbia Ministry of Environment, Lands, and Parks
- Alaska Department of Environmental Conservation
- California Department of Fish and Game, Office of Spill Prevention and Response
- Oregon Department of Environmental Quality
- Washington Department of Ecology
- Washington Office of Marine Safety

From the beginning, task force representatives shared a sense of common purpose focused on proactive development of prevention and response policies and programs. Its mandate was to investigate ways to prevent oil spills, review response procedures, assess means for handling
compensation claims, and develop coordinated contingency planning requirements.

Based on the work of four committees (Prevention Alternatives, Emergency Response, Financial Recovery, and Technology Sharing), as well as extensive public input, the task force published a major report the next year which included 46 joint policy and program recommendations aimed at federal or state/provincial agencies and the oil transportation industry. The report also contained a number of recommendations specific to each member's jurisdiction, which members had committed to implement within their jurisdictions.

These recommendations covered:

- **Vessel traffic reduction**, through petroleum conservation, with alternative routes and modes to protect sensitive areas.

- **Vessel traffic management**, using tug escorts, Vessel Traffic Service (VTS) systems, near miss reporting systems, vessel safety measures, and improved tow cables and towing systems.

- **Vessel design standards**, including double hulls, and improvements in onboard navigation systems.

- **Personnel standards**, such as spill prevention and response training requirements for vessel and tug crews, and for petroleum facility workers; mariner qualifications; and assignment of dedicated crews to tugs and tank barges.

- **Enforcement, penalties, and liability programs**, such as strong sanctions, proof of financial responsibility, natural resource valuation, cost recovery, states' rights to exercise liability standards, increased Coast Guard enforcement, and adequate enforcement staff for states/province.

- **Regulatory oversight**, focusing on requiring spill response and prevention contingency plans, establishing minimum planning standards and cleanup requirements, encouraging local participation, and requiring periodic inspections.

- **Spill response standards**, such as standards for response equipment and personnel, response training, response drill requirements, transfer operation program reviews and spill containment requirements, contingency planning, mutual aid arrangements, and use of incident command systems (ICS) during response.
Research coordination was also recommended, plus development of a spill prevention education strategy for industry and the public.

Since publication of the report, most of these recommendations have been incorporated into state and provincial programs. They are also reflected in the Oil Pollution Act of 1990 and subsequent U.S. federal rulemaking. Also pursuant to a recommendation in the report, member agencies have continued to coordinate on a number of levels.

We have coordinated our response to regulatory initiatives at the federal and international levels. For example, the task force has submitted consensus comments on a number of federal initiatives ranging from safety measures for single hull vessels to onboard response equipment requirements, drill and exercise programs, escort vessel requirements, and the U.S. National Contingency Plan.

The task force and its member jurisdictions have coordinated with the Pacific States Marine Fisheries Commission to develop an educational program targeted at private and commercial fishermen. The program aims at reducing small oil spills which result from overfilling fuel tanks or dumping oily bilge waters. It has also produced a single, easy to remember, coast-wide oil spill reporting number (1-800-OILS-911) which automatically routes the call to the emergency service of the state or province from which the call originates.

Task force members signed agreements at their last annual meeting (July 1993) which committed them to common use of this number and the related educational program, and to use of the unified command structure of the incident command system; to mutual assistance procedures in the event of a spill event which exceeds a member’s response capacity or is likely to cross jurisdictional borders; and to a procedure for sharing the multimedia spill tracking GIS system developed by BC Environment.

In addition, the task force has continued to work on consistent policy development through annual updates of rule comparisons, by circulating drafts of regulatory proposals, and by sharing information through quarterly meetings and a monthly information exchange, as well as through ongoing informal contacts.

And in the most concentrated effort at proactive coordination since the development of the 1990 report, the oil spill task force has just completed a strategic planning process which began with our 1993 annual meeting and planning retreat, has included a stakeholder survey and public comment on the draft plan, and is involving a wide range of interests in its implementation.
The Next Five Years

While program development has followed roughly the same track in each jurisdiction as a result of the 1990 effort, differences exist either as a result of varied experience or the unique nature of one jurisdiction or another. We have decided that it is time to take stock of those differences, and so have begun what we are calling a "program consistency review" to compare major elements of our programs.

This review will examine prevention and contingency planning requirements, prevention program elements, wildlife rehabilitation and volunteer training programs, public education programs, resource damage assessment programs, financial responsibility requirements, responder immunity, response organization standards, inspection programs, ICS policies, penalties, and incentive programs.

This review will provide a basis for recommendations to member jurisdictions regarding program conflicts, gaps, and steps to improve consistency. We strive for greater consistency not just because the regulated community seeks it, but because we acknowledge that consistency can enhance the effectiveness of all our efforts, both for prevention and response.

Our 1994-1999 Strategic Plan acknowledges that many elements of our preparedness and response programs need "fine-tuning." Initially we are focusing on drills and exercises, on our regulations governing cascading of private equipment, and on our regulations governing the use of in-situ burning and dispersants. Other priorities over the next five years will include unified command training, sensitive area protection strategies, salvage, decanting, and natural resource damage assessment policies, volunteer programs, incident investigations, and spill volume determination methodologies.

Yet our strategic plan echoes the 1990 report in acknowledging that no matter how effective our preparedness programs or how efficient our responses, the most effective program is a good prevention program. Based on an evaluation of spill causes and a comparison of existing prevention programs, we will move on to develop a "prevention program package" that can be adapted by each member jurisdiction. That package will address such elements as:

- Training and standards intended to minimize human errors.
- Design and operation standards for vessels, facilities, and pipelines.
• Criteria for vessel traffic routes and monitoring, exclusion zones, sanctuaries, navigation standards, and piloting.

• Coordinated vessel inspection and screening based on a compatible West Coast database and compatible risk assessment criteria.

• Identification of resources to assist vessels at risk.

• Incident investigation and evaluation for purposes of updating our understanding of the causes of spills.

• Public education programs which involve concerned citizens in reducing small chronic spills.

• A spill prevention awards program.

Our efforts to prevent oil spills from vessels will be greatly assisted by the fact that one of our members, the Washington Office of Marine Safety, is dedicated solely to development and implementation of prevention programs focusing on vessels. They have already taken the lead in development of a vessel risk database, screening and inspection programs, and programs focusing on reducing human error.

And both our preparedness/response and prevention efforts will include analysis of issues of jurisdictional authority as well as coordination on research and development of new technologies, plus advocacy for research priorities with federal and private funders.

Who will make all this happen? According to our strategic plan, the public will play a major role. Workgroups are being created to implement these projects, and we currently have 27 volunteers from industry, environmental groups, and other state or federal agencies joining representatives from task force agencies to do the analysis and develop the recommendations to our members which are required in each instance. Projects will be taken on each year, as announced in each draft Annual Work Plan, which goes to our nationwide stakeholder mailing list for comment.

Conclusion

What do we expect to accomplish by these efforts? We expect to:

• Prevent oil spills on the West Coast—both large spills that occur rarely but cause catastrophic impacts, and small spills that occur daily and have an equally devastating cumulative effect.
• Coordinate communication, policy development, response capabilities, prevention and preparedness initiatives, and education in order to maximize efficiency of effort; to learn from one another and share ideas and products.

• Clarify the roles and responsibilities of state and provincial agencies and federal agencies in order to reduce regulatory gaps, overlaps, and conflicts.

• Advocate in national and international arenas on selected issues of common concern, earning respect through credibility, clarity of purpose, and collaboration.

• Educate the public on the impacts of oil spills and issues relating to spill prevention, response, and remediation. Work cooperatively with federal agencies, vessel operators, the oil industry, response contractors, interest groups, and all concerned citizens to create opportunities for political and technological breakthroughs by serving as a catalyst for progressive change.

• Serve as a model of cooperation and coordination for the rest of North America.

 Needless to say, this amount of effort and the controversial nature of some of these issues will test our commitment, both to the effort necessary and to our goal of consensus. Yet we believe that our individual efforts represent investments which guarantee payoffs in the form of more efficient state or provincial government programs leveraging greater protection for our varied and unique marine resources.
Development of Technology Protocols for Oil and Hazardous Substance Spill Response Appropriate for the State of Alaska

Leslie A. Pearson
Alaska Department of Environmental Conservation
3601 C Street #1334, Anchorage, AK 99503

Abstract

On March 24, 1989, as the oil spread from the T/V Exxon Valdez throughout Prince William Sound, the floodgate swung open and entrepreneurs raced out to promote the use of their concepts, inventions, or products designed for spill response. Thousands of product packets were submitted to the U.S. Coast Guard, Environmental Protection Agency, Exxon, and the state. At that time, there were no standard tests and methodologies adopted by the federal and state government to review and screen the products.

In 1990, the Sixteenth Legislature reviewed issues related to response actions and planning involved in the release or threatened release of oil or a hazardous substance. One of the outcomes of that review was the establishment of Title 46, Chapter 13, which founded the Alaska State Emergency Response Commission (SERC) and the Hazardous Substance Spill Technology Review Council (HSSTRC). AS 46.13.100 indicates that the Legislature "(1) finds and declares that there exists a lack of scientific knowledge concerning the availability, properties, and effectiveness of various hazardous substance containment and cleanup technologies; and (2) concludes that it is in the best interest of the state and its citizens to establish a Hazardous Substance Spill Technology Review Council . . . to assist in the identification of containment and cleanup products and procedures for arctic and subarctic hazardous substance releases and make recommendations to the departments and agencies of the state regarding their use and deployment."

As a consequence of this conclusion, AS 46.13.120 mandates that the HSSTRC establish testing protocols to be used by the Department of Environmental Conservation (ADEC) to evaluate the effectiveness of oil and hazardous substance spill technologies for use in the state. Two protocols have been developed to date. The protocols for chemical product use and bioremediation product use are designed to be utilized by the vendor or manufacturers prior to, rather than during a spill event. The protocols are intended to expedite the
approval and potential use of a new product that has never been utilized on a spill in the State of Alaska.

Introduction

The HSSTRC held their first meeting on March 20, 1991 and staff presented a draft protocol packet to the members. The HSSTRC reviewed the packet and recommended to staff the need to research the status of protocols and standards development on a national and international level. The staff's finding on testing protocols/standards development are:

- The American Society for Testing and Materials (ASTM) established the E-20 Committee on Hazardous Substances and Oil Spill Response. The scope of the committee is to formulate test methods, specification, classifications, standard practices, definitions, and other standards pertaining to performance, durability, strength of systems, and techniques used for the control of oil and hazardous substance spills.

- The Canadian General Standards Board (CGSB) established a sorbent subcommittee to develop a testing protocol and manage a qualification and certification list for sorbent materials. Environment Canada had taken the lead in organizing and coordinating the development of sorbent testing standards for oil and hazardous substance spill response. In cooperation with the USCG, Marine Spill Response Corporation (MSRC), and Environment Canada, a sorbent database has been developed to assist consumers with the selection of sorbents for industrial, freshwater, marine, and land application.

- The Department of Interior, Minerals Management Service (MMS), U.S. Environmental Protection Agency (EPA), USCG, U.S. Navy, and Environment Canada developed two protocols for testing containment boom and skimmers in a test basin environment with petroleum products.

- The National Environmental Technology Applications Corporation (NETAC) and the EPA Bioremediation Action Committee (BAC) prepared a draft Oil Spill Bioremediation Products Testing Protocol Methods Manual in 1992. The protocols are designed to standardize procedures for identifying the effectiveness and safety of different bioremediation products.
A conclusion from the research was that a gap exists for protocols/standards relating to the use of chemical and biological products for arctic and subarctic conditions. The NETAC bioremediation protocols indicate the use of seawater from the southeast portion of the United States which does not provide a realistic medium for Alaskan waters.

The Protocol for Chemical Product Use and Bioremediation Product Use on Spills in Alaskan Waters is designed as a literature review criteria for evaluating response technologies and also provides an initial series of testing procedures for spills in arctic/subarctic conditions.

**Purpose**

The primary purpose of the development of protocols is to establish some order to the entropy that occurs during all spill events. The protocol package is designed: (1) to develop criteria to be used to evaluate chemical and bioremediation response technologies; (2) to provide direction to vendors, manufacturers, and proponents on approval procedures for product use on spills in Alaska; and (3) to provide an initial series of testing procedures for chemical and bioremediation products to be used in marine/freshwater, arctic/subarctic conditions.

**Potential Criteria for Technology Evaluation**

In order to comprehensively evaluate various types of technology for dealing with spills, it is necessary to have a set of well defined criteria that may be used to balance performance and net environmental benefit. The types of criteria that should be considered include efficiency, risk analysis, and feasibility.

**Efficiency**

Efficiency is defined as the ability of a method to meet established cleanup goals. Efficiency measures might include such factors as the percentage of spilled product recovered or neutralized, and such measures could vary greatly depending on the environmental setting. While inherently simple in concept, efficiency measures may be quite difficult to implement in the field. For example, oil recovered after a spill contains a certain amount of water that, if not accounted for, may give a positive bias to the amount of oil recovered. Also, the success of bioremediation techniques measured on the basis of respirometric measurement of oxygen consumption could be biased by other factors that affect oxygen consumption. Careful controls, proper selection of analytical procedures, and explicit quality assurance programs will be necessary to firmly and quantitatively establish the efficiency of any particular type of technology.
Risk Analysis

The proponents of a product should be capable of showing how risk to aquatic life and resources is in fact reduced by their product and application. In determining risk factors involved in using a product, it is important to consider any potential human health impact due to toxic considerations. Additionally, it is important to consider the toxicity of a product and a product/spill material mixture to a suite of species from various taxa. Testing a suite of species will account for individual species tolerance to different classes of compounds. Toxicity must be examined as a function of area impacted, relative level of toxicity, and the duration of toxic conditions. Potential bioaccumulation concerns should be addressed, and toxic consequences should be thoroughly researched through literature review. It is important to have preliminary knowledge of both acutely toxic levels and chronic or sublethal toxic levels. There are environmental endpoints other than toxicity that should be targets of technology performance and safety. For example:

- eutrophication (from nutrients or other biostimulatory substances);
- bioaccumulation (trace elements in nutrient and bioremediation mixes, synthetic chemicals in chemical treatments, dispersants, sorbent material, etc.);
- biological communities’ integrity and recovery (i.e., washing temperatures or pressure that strike a balance between shoreline ecosystem damage and oil removal);
- geomorphological integrity of shorelines (i.e., berm relocation, washing pressure or dispersants affecting grain size, porosity, and thus inhabitants such as clams).

Feasibility and Logistical Analysis

The protocol process for spill technologies considers the relative feasibility of different products in relation to Alaska locales. The following are factors that should be considered for evaluating feasibility:

- availability in relation to Alaska locations;
- time required to execute the methodology;
- type of spill the technology is effective on at the surface, near surface, and subsurface;
• cost/efficiency comparison for the methodology and other potential techniques;

• logistic consideration necessary for implementation and demobilization of the methodology;

• setting restrictions for the methodology;

• environmental variables, concentration of materials and their potential influence on the efficiency of the methodology (e.g., temperature and other climatic factors; competitive uptake of nutrients by shore plants and algae); and,

• liquid and solid waste streams generated by the method, including analysis of stability, biodegradable characteristics, reusability, and disposal options.

Impacts such as trampling marshes to apply a product and the disturbance to wildlife reproduction from machinery are additional logistical considerations for testing a product.

A comprehensive protocol procedure must take into consideration all of the factors that play a role in determining the ultimate feasibility of a technology for the multitude of settings and environmental conditions found in the State of Alaska. It will not be enough for a product to be shown to be benign in a risk analysis and effective in one or possibly more field applications. To receive support from the federal on-scene coordinator (FOSC), state on-scene coordinator, and Alaska Regional Response Team, the technology must be shown to be effective under all of the settings and environmental conditions for which its use is proposed.

**Protocol Overviews**

AS 46.13.120 mandates that the Hazardous Substance Spill Technology Review Council establish testing protocols to be used by the ADEC to evaluate the effectiveness of spill technologies for use in the state. The purpose of this section is to:

• provide protocol overviews for the two categories of technology, chemical and biological, and,

• provide guidance for testing sorbent and mechanical products to manufacturers and vendors.
The overview for each category is procedural outlines which provide a framework for the development of a detailed and definitive review structure. The Protocol for Chemical Product Use on Spills in Alaskan Waters is patterned after the State of Alaska Protocol (Viteri and Clark 1990). The Protocol for Bioremediation Product Use on Spills in Alaskan Waters is patterned after the combined NETAC/ADEC protocol for bioremediation (NETAC 1992).

Although approximately 30% of the product testing inquiries come from sorbent manufacturers and vendors, staff recommended the HSSTRC not develop a protocol for sorbent use in Alaska. Instead, the HSSTRC was encourage to adopt the protocol developed by the CGSB and utilized by Environment Canada. Environment Canada has taken the lead in developing and testing sorbent products for oil and hazardous substance spill response. A sorbent database has been developed by the U.S. Coast Guard, Marine Spill Response Corporation, and Environment Canada to assist consumers with the selection of sorbent products. Information obtained from the sorbent tests performed by Environment Canada should be submitted to the Alaska Department of Environmental Conservation, Division of Spill Prevention and Response, 410 Willoughby Avenue, Suite 105, Juneau, Alaska 99801.

These protocols are designed to assist in determining criteria that may be used to balance product performance and net environmental benefit. The types of criteria considered include efficiency, efficacy, toxicity, and risk analysis.

The methodologies described in the protocols are intended to provide the product proponent with a basic means to develop information which may demonstrate the ability of the particular product. The protocols are not designed to preclude research and development of future innovative technologies.

All of the protocols include and allow for product testing on “spills-of-opportunity.” Prior to testing a product on a spill-of-opportunity, the proponent must obtain a letter from the ARRT giving them authorization for use.

Conclusion

Although the protocols represent a HSSTRC consensus regarding the demonstration of a product’s capability, they are by no means the only methods to provide such information. Using these protocols and gathering the data is no guarantee that any particular product will be selected by a spiller, the state, or the ARRT for use on a spill. Products which do not have this type of information may find difficulty in demonstrating their
value for spill response. A product proponent, manufacturer, and/or vendor is required by the National Contingency Plan (NCP), Subpart J, to submit a Request for Authorization of Use to the ARRT prior to field testing in Alaska. It is the responsibility of the spiller, FOSC, and SOSC with assistance from the ARRT and the federal/state resource trustees to make the decisions as to how they will manage the response to a spill. Product data gathered using the protocols will be provided to the FOSC, SOSC and ARRT to assist in the decision-making process.

References


A Research Program to Ensure That Best Available Technology Is Used in Preventing and Responding to Oil Spills in Alaska and the North Pacific

Walter B. Parker
Alaska Hazardous Substances Spill Technology Review Council
3724 Campbell Airstrip Road, Anchorage, AK 99504

Abstract

This paper will identify the gaps in present oil spill prevention and response programs in Alaska as identified by the Alaska Hazardous Substances Spill Technology Review Council (HSSTRC). It will then discuss the research program being set up to fill these gaps and to ensure that best available technology is available to Alaskan shippers and responders. This plan will describe research goals in several areas including prevention, response, remediation, damage assessment, and restoration. The HSSTRC is coordinating this plan in cooperation with the Interagency Federal Oil Spill Coordinating Committee.

Funding for research will be discussed, in particular the utilization of $5 million from the Exxon Valdez criminal settlement appropriated for oil spill research and development (R&D) in the 1993 Alaska Legislature for use until December 1, 1997.

Introduction

The most important element in formulating a research program to ensure that best available technology is used in preventing or responding to oil spills in Alaska and the North Pacific is: a knowledge of the history of spill prevention and response in the region, and use of a reasonable forecast of the future of oil and gas development in Alaska.

It is the fashion among many in Alaska, in industry, government, media, and universities, to take the position that since North Slope reserves are declining, there is no justification for major improvements to the system. Few publicly take the position that oil and gas will be produced and transported in Alaska for at least the next 20 years and more probably the next 50. Few are willing to take the position that the risk of oil spills will be with us for the foreseeable future. Thus, the need for
improvement of prevention and response systems is not lessened, but is a constant that should have ongoing risk analysis applied to point the way to the most effective improvements that can be supplied by industry and government research and will be mandated by the regulatory agencies when necessary.

In recent years, since the demise of the Soviet Union, it has also become fashionable to take the position that the need for domestic production is no longer a strategic requirement of the United States and that the U.S. oil industry should seek its new reserves in areas where costs are less and regulation less stringent. This view is not reflected in most foreign policy publications, such as Foreign Affairs or Foreign Policy, where most analysts define a far more dangerous world than that of the Cold War. The danger to the United States may be less, but the overall world picture is one of increasing nationalistic and ethnic strife, leaving the United States as the only dominant power to play policeman to the world—a lonely position at best—and one that could become untenable if the United States must constantly rescue overseas energy sources from local wars without the security of domestic energy sources to rely upon. For this and many other reasons, it seems a reasonable assumption that oil and gas development will continue in Alaska. The North Sea operators seem to have reached that conclusion based upon their recent investment schedules.

While present North Slope reserves are around 6 billion barrels and Cook Inlet 100 million or so, it seems likely that new finds will lead to between 10 and 20 billion barrels transported through Alaska and its adjacent waters over the next 20 years. The risk ahead is as great or greater than the risk behind us if we allow present systems to continue without substantial improvement.

Risk of Present Systems

The main disadvantage of present systems that have transported Cook Inlet oil and gas for over 30 years and North Slope products for 17 years is the age of the physical plant. Replacement will be a much larger factor in the future than in the past. The question most operators must face is whether their best solutions rest with increasing maintenance costs or replacement. Then the decision is whether risk will be lessened by replacement with best available technology or whether replacement will be dictated by the lowest cost.

Sometimes best available technology and lowest cost solutions may coincide, but this happy situation cannot be counted on by regulators whose driving motive is to lessen risk.
Measuring risk against pre-\textit{Exxon Valdez} risk, one must look at pipeline components that are 5 years older in most cases, tankers that are 5 years older, manning practices at sea and ashore that have shown no dramatic improvements, no big improvement as yet in support systems such as pilotage, vessel traffic systems, and navigation in the marine environment, or fail-safe operating procedures on the pipeline.

There have been analyses of risk undertaken in the past five years, by the Bureau of Land Management (BLM) recently on the Alyeska pipeline and by the Coast Guard on tankers that revealed the problems of those tankers constructed of high tensile steel. However, these have not as yet resulted in changes or solutions. A most dramatic change has been in the restrictions placed upon operations in high winds at Hinchinbrook Entrance by the Coast Guard Captain of the Port at Valdez after interviews with tanker captains revealed their fears of operating in high winds in the approaches from the Gulf of Alaska.

The major requirements imposed on tankers by the Oil Pollution Act of 1990 (OPA 90) and State of Alaska actions that are presently in place, are tug escorts to Hinchinbrook Entrance and two watch officers at all times in coastal waters. Taken together, these probably balance the increased age of the ships, so overall risk is about what it was on March 24, 1989.

**Present Status of Oil Spill Response Actions**

As a result of Alaska legislation and OPA 90 requirements, the oil spill response systems in Prince William Sound and Cook Inlet should be highly effective when mechanical recovery is possible. Great progress has also been made in in-situ burning but present techniques are limited to periods when the oil can be boomed to effect a controlled burn.

The two areas of most concern in response and recovery are those periods when wind and wave action prevent mechanical recovery and those areas distant from any response depot. The most likely and presently preferred bad weather response would be use of dispersant. This is beginning to target research requirements so that dispersants can be more closely matched to the oil they are dispersing and to the water temperatures in the arctic and subarctic areas.

The need for better response in areas distant from response depots will lead to a closer examination of what is possible with on-board response systems. This will focus on the possibilities of greater use of chemical responses and of enhanced bioremediation.
The Role of the Hazardous Substance Spill Technology Review Council (HSSTRC)

In the aftermath of the Exxon Valdez oil spill, some 1300 offers were made to the federal and state responders on better ways to recover oil. Many of these proposals were put before the Sixteenth Alaska Legislature. One of the outcomes of this dialogue was the establishment of the HSSTRC within the Alaska State Emergency Response Commission (SERC). The HSSTRC's primary responsibility is to ensure that best available technology is known to and available to Alaskan responders.

The HSSTRC is made up of members from state agencies (Alaska Department of Environment Conservation (ADEC) and the Department of Military Affairs (ADMA)), federal agencies (the Coast Guard and EPA), the University of Alaska, the Governor's Science Advisor, the Prince William Sound Science Center, and four private members, one from each of the state's four judicial districts.

The HSSTRC has formed a close working relationship with the federally sponsored Oil Spill Recovery Institute (OSRI) created in OPA 90. OSRI staff is under contract to ADEC to aid the HSSTRC in implementing its goals.

The following areas of interest are being followed by the HSSTRC:

- The interaction of human factors and the use of new technology in hazardous substance and oil spill prevention and response.
- New technologies in spill prevention and response that offer promise in meeting the needs of federal/state area plans.
- Technologies for dealing with the radiation detection and containment problems of Alaska.

A strategic plan for guiding research in these areas is under development by staff at the OSRI. Three working groups composed of HSSTRC members, government agencies, Regional Citizens' Advisory Councils (RCACs), Local Emergency Planning Committees (LEPCs), and industry have been set up to provide input to the HSSTRC in guiding strategic plan development. The three groups focus on human factors, radiation, and the overall strategic plan. Other groups will be established if necessary in other areas. The first draft of the strategic plan will be available on or about 30 April 1994, the plan on or about 1 August 1994.

The strategic plan will be designed to provide a strong arctic-subarctic component to the federal plans being developed by the Interagency Federal Oil Spill Coordinating Committee. Its primary purpose
will be to provide guidance to Alaska Department of Environmental Conservation and other agencies in their research programs over the next three years.

Much of this research will be funded by the $5 million ADEC received from the Exxon Valdez criminal settlement through the 1993 Alaska Legislature. It is our intent to use these funds to provide a base for cooperative efforts with the federal government, other states, RCACs, and industry whenever possible.

We are already using HSSTRC funds in this manner whenever possible, most recently to fund a workshop on Oil Spill Response in Dynamic Broken Ice held in Anchorage 6-8 March 1994 in cooperation with the Cook Inlet Spill Prevention & Response Inc. (CISPRI). Cook Inlet RCAC, ARCO, and Alaska Clean Seas (ACS). Ice has been a HSSTRC priority since its beginning in 1991.

The HSSTRC is very pleased with the progress made on in-situ burning as a response tool. When we have all the information in on the Newfoundland burn, in which we participated, we can plan our next step in this area. We have received great support from industry co-ops, i.e. ACS and CISPRI, in getting to our present position.

As stated before, areas of concern remain oil spill recovery in bad weather when mechanical recovery is not possible and recovery in areas distant from response centers. This includes almost all of Western Alaska, Bristol Bay, and Aleutian areas distant from Dutch Harbor. A possible answer to the latter problem may lie in enhanced on board recovery, an area the Coast Guard and affected shippers are beginning to confront.

In human factors, after our initial identification of this area as one requiring attention, Cook Inlet RCAC sponsored a meeting attended by many organizations dealing with spill response and oil transportation in general. As a result of this meeting, Prince William Sound RCAC and Cook Inlet RCAC are funding a joint investigation into human factors in Alaska. The results of this will be available to us as input to our strategic plan.

As we pointed out in the prevention section of our 1992/1993 annual report, 73% of all marine incidents are due to human factors, i.e. lack of training in new procedures, fatigue, complacency, and other causes. The host of new technologies that are becoming available to mariners emphasizes the need for concentration on human factors now.

Remote sensing and coordination of geographic information systems continue to be priorities of the HSSTRC. We have funded the University of Alaska to investigate the use of radar satellites in tracking oil spills in the Arctic Ocean and the Gulf of Alaska.
In its first report (1993), the National Research Council's Marine Board Committee on Oil Spill Response strongly made the point that the Federal Interagency Oil Pollution Research and Technology Plan was severely lacking in the areas of prevention. In our last HSSTRC report, we identified areas of improvement needed in ships, crews, powerplants, navigation systems, steering systems, human factors, and vessel traffic systems. We are already seeing a good deal of activity by federal agencies and industry in several of these areas. We intend to continue closely coordinating with the interagency committee, the Arctic Research Commission, and the members of our working groups to enhance prevention in all elements as rapidly as possible.

**Summary**

The cost of maintaining a strong R & D position by the State of Alaska can be handled by minimal expenditures on improving the prevention and response to oil spills. The three-year strategic plan being developed now will expend about $2 million per year.

This funding will provide independent state programs and state participation in federal and industry programs that are relevant to Alaska problems. The state funding has been used in the past to level research in the direction necessary for Alaska to accomplish its goals in spill prevention and response.

Some feel the job has been done and it is time for Exxon Valdez to go away. Some feel that we should maintain a continuing state presence in research on prevention and response to oil spills as long as the state is in the oil business, whether that be another 20, 50, or 100 years. The cost of ongoing R & D for 100 years will be 15% of the cost of the single incident of the Exxon Valdez.
Screening for Acceptable Risk

Barbara Herman

Washington State Office of Marine Safety
P.O. Box 42407, Olympia, WA 98504-2407

Abstract

Screening for Acceptable Risk explores an innovative program developed by the Washington State Office of Marine Safety (OMS) to screen cargo and passenger ships for risk posed to the marine environment. The Washington State OMS screening program uses a database of risk-related vessel data and a risk matrix based upon expert opinion of experienced Puget Sound mariners. The matrix prioritizes ships for boarding and inspection.

The risk matrix relies upon 11 weighted risk elements such as vessel age, flag, and casualty history. Each ship screened by the matrix receives a numerical score and is assigned a priority for boarding. Ships found to pose high risk are boarded by OMS personnel and examined with an emphasis on human factors. Data gathered during boarding further populates the OMS database.

A “confidence interval” now being designed by OMS will measure the performance of the screening program. Risk predicted by the matrix will be compared to actual findings of OMS vessel examinations. These findings will facilitate continuous improvements in the risk assessment process.

Consistent with recent reports linking most vessel casualties with human error, OMS’s early findings call for increased collection of information on management practices, personnel histories, and records of past vessel incidents. A coordinated international effort by government and industry is needed to make significant human factors data available to the world maritime community for vessel screening and marine safety purposes.

Introduction

The 1991 Washington State Legislature responded to the Exxon Valdez spill by creating the Washington State Office of Marine Safety (OMS). OMS is the nation’s first state oil spill agency with the principal mission of oil spill prevention, rather than response. OMS has moved assertively to establish innovative programs to reduce the risk of marine oil pollution events in Washington State.

The 1991 Washington Legislature directed OMS to establish a screening program to identify large cargo and passenger ships that “pose a
substantial risk of harm to the public health, safety, and environment" (RCW 88.46.050). This paper explores the recently developed OMS screening program to identify high risk cargo and passenger ships.

Overview of the OMS Vessel Screening Program

Washington State’s screening program for cargo and passenger vessels 300 gross tons or larger begins when a vessel submits an advance notice of entry prior to entering Washington State waters (WAC 317-30-080). The advance notice of entry provides times of arrival and departure, port arrangements, and basic vessel information.

Upon receiving a ship’s notice of entry, OMS enters relevant data on that ship into a risk matrix. Data on each arriving ship are accessible to OMS from various sources, including the advance notice of entry, Lloyd’s Register of Ships, U.S. Coast Guard casualty and violation histories, agents, owners, operators, and various publications. OMS also regularly reviews various trade publications for risk information including Lloyd’s List, The Journal of Commerce, Marine Response Bulletin, and Golob’s Oil Spill News Letter. OMS maintains this data in the OMS Marine Information System.

The risk matrix was developed by OMS using expert opinion and available data. The matrix assigns risk weights to vessel particulars including vessel age, vessel type, classification society, owner type, and flag. Changes of classification society, owner, and flag are also entered into the matrix. History of vessel casualties and violations are entered when available. The matrix generates a numerical score for each vessel which in turn establishes a boarding priority.

Vessels receiving a high priority for boarding are referred to the OMS Puget Sound field office for boarding and examination. Additional data gathered during boarding are also entered into the OMS Marine Information System for use in future inspections of that vessel and to populate a database of risk-related information.

History and Development of the OMS Risk Matrix

Early in 1993, the Washington State Office of Marine Safety, working in conjunction with the National Ports and Waterways Institute, a consortium of universities including The George Washington University, Rensselaer Polytechnic University, and Louisiana State University, began development of a vessel risk model for Puget Sound and the Strait of Juan de Fuca. Because sufficient reliable data are currently not available to adequately evaluate risk, a model based upon expert opinion was selected.
By concentrating on Puget Sound and the Strait of Juan de Fuca, OMS gathered all available local data. To support the risk model, data was obtained from the U.S. Coast Guard and the Marine Exchange of Puget Sound, including casualty data from the Coast Guard CASMAIN file, pollution data from the Coast Guard Marine Safety Information System, and Unintended Incident Data from the USCG Puget Sound Vessel Traffic System.

Approximately 35 maritime experts were extensively interviewed, representing the U.S. Coast Guard, Puget Sound Pilots, Columbia River Pilots, the shipping industry, the towboat industry, and environmental groups. The results of questionnaires completed by the experts comparing relative risk situations were computer generated and mathematically tabulated.

The results of the data collection and expert opinion survey were then integrated into the risk matrix. Eleven risk categories were identified including such factors as age, flag, and vessel type. Each of the 11 risk categories were further divided into subcategories which correspond to the risk posed. For example, under “flag,” five subcategories were created: (1) U.S./Canadian, (2) traditional maritime, (3) flag of convenience, (4) new offshore, and (5) other. Each category was defined and assigned a numerical score representing the risk posed by that category of vessels in the opinion of the Puget Sound experts.

To illustrate this process, the M/V Isabella, a Panama flag ship, would receive a score of 0.016975 for the flag category. This score is assigned to all ships sailing under a flag of convenience, in this case Panama. If the M/V Isabella had been a Canadian flag ship, a score of 0.003575 would have been recorded to reflect the lower risk determined by the experts to be attributed to a Canadian flag ship.

Each of the 11 risk categories are similarly scored for each ship. The result is a numerical score reflecting the relative risk posed by that ship. Washington OMS forwards data on high risk ships to the OMS Puget Sound field office with a recommendation for boarding. High risk ships are then boarded by OMS inspectors.

The Eleven Risk Matrix Elements

The OMS risk matrix consists of 11 statistically weighted risk elements. These elements were chosen by the experts as relevant indicators of risk. The elements were also chosen because the data required are available in maritime publications and existing databases. Discussion of each of the 11 elements follows.
Vessel Age

Vessel age is divided into three increments: 0-15 years, 16-25 years, and 25 years or older. Older ships are assigned higher weights. The 16-25 year increment coincides closely with protection and indemnity (P&I) club data indicating ships in the 15-20 year age range generally submit a disproportionate number of structural failure claims. Beyond 15 years, even well maintained ships begin to suffer from metal fatigue and the cumulative effects of shear and bending stresses on the hull. Beyond 25 years an increasingly heavy maintenance burden increases risk.

Vessel Type

Vessel type is divided into six subcategories: (1) uninspected vessel, (2) tug with tank barge, (3) ferry, (4) tanker, (5) dry/log carrier, and (6) container. OMS regulates cargo and passenger vessels of 300 gross tons or greater, so most private yachts, small fishing boats, and other small craft are not represented in the vessel type category. According to expert opinion, uninspected vessels, which include fishing vessels, pose the greatest risk and accordingly receive the highest weighting. American flag fishing vessels are often uninspected and are exempt from pilotage.

Oil tankers receive the third highest risk weight due to the potential for a catastrophic spill. Bulk carriers, general cargo ships, and log carriers are allocated the fourth highest level of risk. P&I club data shows a relatively high percentage of structural failure and pollution claims for these vessels.

Container ships, car carriers, and Roll-on/Roll-off ships are in the lowest risk group. These ships tend to be more professionally operated, cleaner, and newer than other vessel types. Container ships and car carriers are in the business of transporting high value cargo and are almost always in the liner trade. These and other favorable factors contribute to a low risk weight.

Redundancy of Systems

Redundancy of mechanical, navigation, and electrical generation systems on board ships is divided into three subcategories: (1) no redundant system, (2) partial, and (3) total. Total redundancy receives the lowest risk weighting. To qualify for total redundancy, a ship must have twin screws, two independent sources of electrical generation, two steering systems, and two radars. With the exception of many passenger vessels, most vessels receive the partial redundancy risk weight due to being a single screw vessel. A vessel with no redundancy is rarely encountered and usually involves a ship with severe impairments.
Class Society

Class society has three subgroups: (1) International Association of Classification Societies (IACS), (2) IACS/associate, and (3) non-IACS. A vessel which is classed by a classification society that belongs to IACS receives the lowest risk weight due to high standards required by IACS. Eleven classification societies are IACS members. Four classification societies hold IACS associate status, which receives the next highest risk weight. Classification societies that are neither IACS nor IACS associates are labeled "other" and receive the highest risk weight. Approximately 30 other classification societies worldwide fall in the "other" group. Unclassed vessels such as fishing and ferry boats receive the "other" risk weight as a default value.

Owner Type

Owner type lists four owner subcategories including: (1) shipping companies, (2) operating companies, (3) governments, and (4) single ship owners. The experts concluded that a ship owned by a shipping company poses the least risk. Shipping companies are generally well organized and staffed by maritime professionals. A shipping company is in the primary business of owning and operating ships. An operating company may be a bank or other financial institution with limited expertise as a ship owner or operator and is considered a higher risk.

Ships owned by governments receive the second lowest risk weight. National governments tend to be strongly regulatory and generally conscientious in shipboard management practices. The highest risk weight accrues to single ship owners. Single ship owners historically hire lower paid crews, spend less on maintenance, and rely on minimal shoreside staffing.

Determining ship ownership can be difficult. Vessel ownership is often heavily veiled for legal or financial reasons. Because ownership type is a valid risk indicator, increased access to ownership information would improve screening capability.

Pilotage

The matrix assigns zero risk weight to vessels with a pilot on board and very high risk weight to vessels with no pilot. U.S. flag vessels of less than 1600 gross tons do not require a pilot in Washington State. The "no pilot" risk weight is the highest single risk value in the matrix. The experts clearly view presence of a pilot as a major marine safety factor.
Changes in Status

The following are viewed as significant risk factors: (1) changes in ownership, (2) changes in flag, and (3) changes in classification society. The highest risk weight in this category is assigned to vessels with a recent ownership change. Changes of ownership almost always imply risk. When a ship changes owner, an array of unknowns is introduced. Management practices change, new crews are often hired, and organization can falter. For similar reasons, a change of flag receives the second highest risk weight in the change category.

Change of class receives slightly lower risk weight than change of flag. When a ship changes from a non-IACS classification society, like the Croatian Classification Society, to an IACS member like Det Norske Veritas (the Norwegian Classification Society) or the American Bureau of Shipping, the class upgrade is not considered a "change" and no values are assessed. A switch between two IACS classification societies is similarly not considered a change. Class changes which are valued include changes from an IACS or IACS associate member to a non-IACS class society, changes between two non-IACS members, and multiple changes in a short time period even if the ship ultimately is classed by an IACS class society.

Flag

Flag has five subcategories: (1) U.S./Canadian flag, (2) traditional maritime, (3) flag of convenience, (4) new offshore, and (5) other. The experts assigned low risk weightings to U.S./Canada flags and traditional maritime flags (Japan, United Kingdom, Norway, Sweden, Denmark, France, Germany, Italy, Netherlands, and Finland). The flags listed in the three other groups each received similar and higher risk weights. The remaining categories are traditional flags of convenience (Liberia, Panama, Malta, Bermuda, Bahamas, Cyprus, Singapore, and Hong Kong); new offshore registries (Vanuatu, Marshall Islands, Cayman Islands, Honduras, Isle of Mann, Netherlands Antilles, Madiera, and Gibraltar); and "other," which receives the highest risk weighting and includes all other flags.

Violation History

Violation history assigns weights to reportable marine violations: (1) no violation, (2) recent major violation, (3) recent minor violation, (4) repeated major violation, and (5) repeated minor violation. The highest risk weight is assigned to "repeated major violations" followed by "repeated minor violations" followed by "recent major violation" with the lowest risk assigned to "recent minor violation."
Vessel Casualty History

Vessel casualty history refers to marine casualties including collisions, groundings, fires, and other accidents that result in damage to the vessel. Matrix subcategories are the same as for violation history and rely largely upon Coast Guard definitions of major and minor events: (1) no casualty, (2) recent major vessel, (3) recent minor vessel, (4) repeated major vessel, and (5) repeated minor vessel. Other casualties include serious injuries and loss of life.

Key Personnel History

Key personnel history lists personnel violations of senior officers on board the vessel, including the master, chief mate, chief engineer, and first assistant engineer. Subcategories are the same as those found under violation history: (1) no violation or casualty, (2) recent minor personnel, (3) recent major personnel, (4) repeated minor personnel, and (5) repeated major personnel. This human factors information is second only to "no pilot" as a high valued risk score. The difficulty of accessing reliable key personnel history is the single most significant obstacle to effective vessel screening.

OMS Vessel Screening History

The OMS vessel screening program officially began September 24, 1993. During the four-month period through January 28, 1994, approximately 1,438 cargo and passenger vessels and 276 tank ships (total 1,714) entered Washington State waters.

OMS staff resources for screening are not sufficient to screen each ship with the matrix. Accordingly, OMS conducts a cursory screening of every incoming ship to determine whether the ship is likely to receive a high score on the risk matrix. Cursory screening is accomplished by reviewing vessel information in Lloyd's Register of Ships. Lloyd's Register enables the screener to quickly ascertain whether the vessel is likely to score high under the risk matrix. The vessels which are likely to receive a high score are formally screened with the matrix.

Vessels screened with the matrix receive a normalized relative risk score, which is expressed as low (0-10), moderate (11-15), high (16-25), very high (25-50), or extremely high (over 50). During this four-month period, 265 vessels (15%) were identified as likely to score high and were subsequently screened with the matrix as shown in Tables 1 and 2. Early results of the OMS screening program suggest that bulk carriers tend to pose a higher degree of risk than other ship types. This is due primarily to scores received on changes, flag type, and ownership type.
Table 1. Scores of 265 ships screened with the OMS risk matrix.

<table>
<thead>
<tr>
<th>Boarding Priority</th>
<th>Number of Ships</th>
<th>Total Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low priority</td>
<td>8</td>
<td>3 %</td>
</tr>
<tr>
<td>Moderate Priority</td>
<td>102</td>
<td>38 %</td>
</tr>
<tr>
<td>High Priority</td>
<td>113</td>
<td>43 %</td>
</tr>
<tr>
<td>Very High Priority</td>
<td>40</td>
<td>15 %</td>
</tr>
<tr>
<td>Extremely High Priority</td>
<td>2</td>
<td>1 %</td>
</tr>
</tbody>
</table>

Table 2. Ship types of 155 vessels receiving a high priority score with the OMS risk matrix.

<table>
<thead>
<tr>
<th>Type of Ship</th>
<th>Number of Ships</th>
<th>Total Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Carriers</td>
<td>92</td>
<td>59 %</td>
</tr>
<tr>
<td>General Cargo Ships</td>
<td>16</td>
<td>10 %</td>
</tr>
<tr>
<td>Container Ships</td>
<td>10</td>
<td>6 %</td>
</tr>
<tr>
<td>Vehicle Carriers</td>
<td>10</td>
<td>6 %</td>
</tr>
<tr>
<td>Refrigerated Cargo Ships</td>
<td>10</td>
<td>6 %</td>
</tr>
<tr>
<td>Tankers</td>
<td>10</td>
<td>6 %</td>
</tr>
<tr>
<td>Fishing Vessels</td>
<td>5</td>
<td>3 %</td>
</tr>
<tr>
<td>Training Ship</td>
<td>1</td>
<td>1 %</td>
</tr>
<tr>
<td>Research Vessel</td>
<td>1</td>
<td>1 %</td>
</tr>
</tbody>
</table>

A Sample Screening

The M/V Zhuang He entered Puget Sound on February 25, 1994. The vessel is a nine-year-old container ship sailing under the flag of mainland China and classed by Zianlian Chuen, the China classification society. The M/V Zhuang He received a high priority (21.8) for boarding. Appendix A illustrates the operation of the OMS risk matrix. The six-decimal figures found in the weight column are relative statistical weighing factors and not percentages.

Factors contributing to the high priority score for the M/V Zhuang He were classification society type, change of classification society, flag type, and a recent major casualty.

The China classification society is an IACS member, but only receives the IACS Associate risk weight. The experts recommended that three IACS classification societies, the China classification society, the Russian Register of Shipping, and the Polish Register, be assigned the IACS Associate risk weight for purposes of risk analysis to reflect a higher risk rating than other IACS members.
The change of class on the M/V Zhuang He occurred between two IACS members, Germanischer Lloyd (the German classification society), and the China classification society. Normally, such a change would not be assessed, but since the China classification society has been accorded IACS Associate status, this change is regarded as a downgrade, and therefore an indicator of risk.

The flag of China receives the highest level of risk of any flag type. The experts placed the China flag in the “other” category as a slightly higher risk than flags of convenience. The ship received a recent major casualty score based upon an October 27, 1993, incident in which the Zhuang He struck the breakwater and grounded while proceeding toward the entrance to the Panama Canal.

The Matrix and Vessel Boardings

The purpose of the screening program is to provide guidance to OMS on vessels to board for inspection. The matrix provides an approximation of risk that should correspond with actual shipboard conditions. To test the validity of the matrix, OMS is devising a scoring system for vessel boardings that will allow a comparison of the predicted risk, based upon the matrix, against an actual risk assessment determined by OMS inspectors after ship inspection.

Before such a “confidence interval” may be established, the vessel boarding process must be fully quantified. Upon boarding a ship which has received a high score under the matrix, OMS inspectors examine a number of areas, including:

Operating procedures
- cargo and bunker transfer
- navigation
- engineering
- emergencies
- watch procedures
- management practices

Technology
- navigation
- communications
- deck equipment
- engineering equipment
- construction
- spill response
Management
audits and inspections
environment and pollution
maintenance
safety
Personnel
communications (languages spoken)
health and fitness
manning
training
working hours restrictions

After boarding, each of these areas is scored, given a statistical weight, and a boarding score is calculated. This numerical score may then be compared with the risk score derived from the risk matrix. For example, if a ship receives both a matrix risk score of "very high" and a "poor" boarding score, the matrix accurately predicted the risk posed by the vessel. In essence, risk is predicted by the matrix and verified by actual observation during the boarding process.

OMS is currently quantifying vessel boarding criteria. When a significant number of boarding scores have been compared to the corresponding relative risk scores provided by the matrix, OMS may report the percent accuracy of predicted risk and a confidence interval will have been established. The confidence interval serves as a valuable quality assurance measure that signals the need to modify and improve the matrix.

Acquisition of Human Factors Data

The information highway has certainly not found its way to the maritime industry. As a result, the most critical information in the matrix is the most difficult to ascertain. Vessel casualty history, key personnel data, and data on shipboard management practices provide critical human factors information essential to assessing risk. Unfortunately, this information is often closely held and difficult to obtain.

While governments and industry maintain a wide variety of informational materials critical to screening ships for risk, the means to convey this information to needed users does not yet exist. To populate the OMS marine casualty database, considerable effort is being made to identify and gain access to existing casualty databases. Some of the organizations that maintain marine casualty databases include the United States Coast Guard (MSIS), foreign coast guards, the Paris Memorandum of Port State Conventions, P & I clubs, Lloyd's of London, Lloyd's (SEADATA), and shipping company vetting departments.
The international maritime community must establish a priority to commit resources to collectively making information universally available about vessel casualty histories, personnel performance records, and actual shipboard management practices. This critical information is essential to governments and industry seeking to reliably screen ships for risk.

**Conclusions**

The Washington Office of Marine Safety is committed to innovative strategies to prevent oil spills. Identifying high risk vessels is an integral component in any program to reduce the risk of spill events. The OMS screening and boarding programs are designed to identify and assist vessels which do not present an acceptable risk to the marine environment. In this context, acceptable risk is the amount of risk posed by a well managed vessel in good condition. Acceptable risk is posed by shipboard officers and crew who understand and care about the marine environment and who are trained in the prevention of pollution events.

**Acknowledgment**

Laura Stratton, OMS Vessel Screening Specialist, assisted in the preparation of this paper.
## Appendix A

**OMS risk matrix screening of the M/V Zhuang He**

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Specific</th>
<th>Weight</th>
<th>Weight Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
<td>0-15 Years Old</td>
<td>0.005516</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15-25 Years Old</td>
<td>0.013706</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 25 Years</td>
<td>0.036932</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Vessel Type</td>
<td>Uninspected Vessel/</td>
<td>0.00671</td>
<td>1985 = 9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fishing Vessel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tug w/Tank Barge</td>
<td>0.005507</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ferry or Pass. Vessel</td>
<td>0.002025</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tanker</td>
<td>0.002836</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dry/Log Or</td>
<td>0.002216</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bulk Carrier</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Container/Car</td>
<td>0.001842</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carrier/Ro-Ro</td>
<td></td>
<td>Container</td>
</tr>
<tr>
<td>3</td>
<td>Redundancy</td>
<td>No Redundancy</td>
<td>0.028028</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Partial</td>
<td>0.010166</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0.005482</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Class Society</td>
<td>IACS</td>
<td>0.007858</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IACS/Associate</td>
<td>0.014866</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-IACS</td>
<td>0.041744</td>
<td>ZC</td>
</tr>
<tr>
<td>5</td>
<td>Owner Type</td>
<td>Shipping Company Government</td>
<td>0.009843</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Ship</td>
<td>0.01579</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating Company</td>
<td>0.025526</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.025587</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pilot</td>
<td>Pilot on Board</td>
<td>0</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No Pilot</td>
<td>0.130694</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Changes</td>
<td>Owner Change</td>
<td>0.039409</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Class Change</td>
<td>0.033898</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flag Change</td>
<td>0.034123</td>
<td>GL to ZC</td>
</tr>
<tr>
<td>8</td>
<td>Flag</td>
<td>US/Can Flag</td>
<td>0.003575</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Traditional Maritime</td>
<td>0.004206</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flag of Convenience</td>
<td>0.016975</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>New Offshore</td>
<td>0.016623</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other</td>
<td>0.016999</td>
<td>X</td>
</tr>
<tr>
<td>9</td>
<td>Violation History</td>
<td>No Violations</td>
<td>0.0046</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recent Major</td>
<td>0.014927</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recent Minor</td>
<td>0.008005</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Repeated Major</td>
<td>0.038337</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Repeated Minor</td>
<td>0.019542</td>
<td></td>
</tr>
<tr>
<td>10 Vessel Casualty History</td>
<td>No Casualties</td>
<td>0.007849</td>
<td>Recent Major</td>
<td>0.024856</td>
</tr>
<tr>
<td></td>
<td>Recent Minor</td>
<td>0.014996</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repeated Major</td>
<td>0.073245</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repeated Minor</td>
<td>0.03458</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Key Personnel History</td>
<td>No Violations or Casualties</td>
<td>0.011028</td>
<td>Recent Major</td>
<td>0.036058</td>
</tr>
<tr>
<td></td>
<td>Recent Minor</td>
<td>0.018786</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repeated Major</td>
<td>0.092925</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repeated Minor</td>
<td>0.041582</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total Score | Items 1-11 | Normalized Total (Max 1.0) | 0.117986 | Normalized Score (Max 100) | 21.77663016 |
| Priority for Boarding | High Priority | 0-10 | Moderate Priority | 11-15 | High Priority | 16-25 | Very High Priority | 26-50 | Extremely High Priority | 50-100 |

Comments: Struck breakwater at Cristobal, Panama and grounded. Major damage to bulbous bow with multiple openings. No pilot on board at time of incident.
Class change from GL To 2C. Counting 2C as IACS Associate.
GT: 24,438
LOA: 199.15 M (653 Ft)

ETA Pilot Station: 02/25/94 at 0600 : PS
Destination: Seattle: Pier 18
Agent Name: Norton Lilly
Agent Phone No: 206-623-0930
The Citizens' Perspective of Spill Response

Joe Banta, Tom Copeland, and Tim Robertson
Prince William Sound Regional Citizens' Advisory Council
Oil Spill Prevention and Response Committee
750 W. Second Avenue #100, Anchorage, AK 99501-2168

Abstract

This paper discusses the oil spill response strategy termed nearshore response as developed following the Exxon Valdez oil spill. Nearshore response in this context is a method of response using local fishing vessels and expertise to contain, recover, or divert oil that has escaped containment at the scene of the spill in order to prevent shoreline impacts.

Introduction

During the 1989 Exxon Valdez Oil Spill (EVOS) it became immediately apparent that there were areas of spill response which were not addressed by responders in both a geographic and strategic sense.

Geographic: There are some waters in the Gulf of Alaska which are not covered by response actions of the two major spill response organizations, Alyeska Pipeline Service Co. and Cook Inlet Spill Prevention and Response Organization. An example of such a geographic gap would be a spill outside of the Hinchinbrook Entrance of Prince William Sound (PWS).

Strategic: The other gap in spill response not covered by response action in 1989 is the strategy for which local residents coined the term, "nearshore response." This concept was born out of the fishing and local vessel response which recovered oil-on-water during the many weeks of recovery efforts that it took to pick up the widely dispersed oil throughout the bays and passages of PWS and the Gulf of Alaska (GOA).

Nearshore Response

Much effort has gone into beefing up the initial response capabilities in PWS, and now that capability is recognized as one of the finest in the world. If weather, machinery, and personnel all cooperate to provide optimum conditions, the initial response may be able to effectively contain
and clean up much of the next spill in PWS. However, the fact remains that there is no guarantee of such optimum conditions, and it is likely that some or much oil will escape initial containment efforts. This threat proves the need for nearshore response.

As it was defined by a working group on the subject, nearshore response is the effort to contain, recover, or divert oil that has escaped containment at the scene of the spill in order to prevent shoreline impacts. It is within the framework of nearshore response that local residents and their vessels most clearly fit into the spill response activities.

The value of local knowledge was one of the major lessons learned from the EVOS. Fishermen and local residents clearly proved their capability to respond to oil spills in the successful protection of the PWS salmon hatcheries such as the Armin Koernig Hatchery in Port San Juan. Local response also revealed that there is no question about whether or not the residents of the area will respond—the question is how to focus this wealth of local knowledge and resources so it can most effectively be used in spill response.

One illustration of the efficiency of local fishermen and their vessels is when 100 PWS purse seine vessels captured approximately 15,000 tons (30,000,000 lbs) of herring in one hour of fishing time in 1992. The volume of this catch is equivalent to about one-third of the weight of the EVOS spilled crude oil. This shows that local knowledge and efficient vessels designed for local waters can be a valuable resource in the recovery of whatever is targeted for catch. That target can be spilled oil as well as whatever fish are in season. Alaskan fishermen are seasoned experts at converting their vessels to participate in many fisheries, often under a time crunch as fishing seasons may run into each other. The targeting of oil spills fits well into this framework. In addition, there are dozens of charter boat operators licensed and prepared to transport oil spill response crews as well as the sport fishermen they transport in their regular season.

1990 Legislative Oil Spill Response Requirements

Both state and federal legislative requirements which resulted from the EVOS placed an emphasis on the use of local resources as well as strategies which could make use of these resources for nearshore response as follows:

- The State of Alaska mandates the establishment of local equipment depots and local response corps (under SB 264 passed in 1989).

- The federal Oil Pollution Act of 1990 (OPA 90) requires that oil spill response in Prince William Sound include the mobilization of
local resources (Section 5005). USCG regulations promulgated pursuant to OPA 90 establishes requirements that at least 20% of response equipment required by the USCG be capable of operating in waters of six feet or less. This requirement was to ensure adequate response in the nearshore zone.

- Alaska HB 567 increased the standards for oil spill contingency planning and response for both crude and non-crude oil.

- The Alaska Department of Environmental Conservation (ADEC) required PWS crude oil shippers to develop a nearshore spill prevention and response plan as part of the conditional approval of their overall contingency plan following the EVOS.

1991 Nearshore Workshop

In June 1991, the public, industry (crude and non-crude, large and small), state and federal regulators, and fishermen attended a PWS Regional Citizens' Advisory Council (RCAC) workshop to define nearshore response and discuss the needs in that new field. The results of this workshop were then used to help guide further development of the nearshore response concept. Prior to the workshop, ADEC made the development of "nearshore response planning" a condition of approval of the Alyeska PWS Tanker Spill Prevention and Response Plan.

1992 Nearshore Response Plan

In June 1992 a joint industry/regulatory agency/citizen group called the Nearshore Response Working Group completed over a year’s worth of work and meetings with industry contractors and planners who were developing industry’s nearshore spill response plan. The end result of the cooperation and give and take of these meetings was the development of the first-ever comprehensive nearshore plans which were submitted to ADEC on June 1, 1992. These plans recognize the importance and benefits of using local residents and resources to capture spilled oil.

One of the lessons learned from the EVOS was that fishermen did not have enough storage available for recovered oil, and at times even had to release boomed oil due to lack of storage and pumps. The work group process did not resolve this issue—which is fundamental to the success of nearshore response. Thus, the process left unanswered the questions of what is the appropriate type of intermediate storage container for recovered oil and how many of those containers are needed to ensure adequate storage and transfer during a nearshore response.
RCAC opposed the use of skid-mounted deck tanks as proposed by industry and promoted the use of small "mini-barges" which RCAC felt could carry much more oil and allow simpler and longer response operations and transfers. Fortunately, a USCG decision based upon stability concerns and oil storage vessel certification processes precluded the use of deck mounted tanks on fishing vessels. That decision left industry with only the mini-barge concept as the best option for its nearshore response storage. PWS industry shippers proceeded with plans to build a 250 bbl barge. Cook Inlet shippers opted for a 100 bbl mini-barge. Both industry groups focus on a barge which is less than 15 gross tons to minimize more stringent construction, inspection, and licensing requirements. Another option recently developed by the USCG is a Vessel of Opportunity Skimming System (VOSS).

Concurrently, ADEC, with RCAC's encouragement, initiated development of a Nearshore Strike Team Demonstration Project to build a 650 bbl mini-barge with a skimmer system, and train local residents to use this equipment as part of the state mandated establishment of local equipment depots and local response corps mentioned earlier. While the PWS industry mini-barge concept is based on a static process of boom towing, stopping, pumping recovered oil, then booming again, the state and Cook Inlet concept is based upon a dynamic process of constant boom towing and pumping (skimming) at the same time without the need to stop. The USCG VOSS is a dynamic system which has the option of operating in nearshore waters depending on the depth of the vessel using the system.

One initial benefit of the state project has been the demonstration of the feasibility of constructing, inspecting, and licensing barges over the benchmark of 15 gross tons. A recent USCG decision has clarified that there is no towing license requirement for oil recovery barges under 15 gross tons, while for barges over 15 gross tons a Master's license will be sufficient.

**Implementing the Nearshore Response Plan**

When the plan development began, RCAC was interested in identifying how to bring together all the previously mentioned components—local knowledge, legislative requirements, nearshore response, and lessons learned from the EVOS—into an organization which could most effectively implement nearshore response plans. This interest brought RCAC to the study of a regional oil spill cooperative. An RCAC study looked at options for an organization which could fill the need for implementing nearshore response activities on a local community-based level.
However, industry concerns and funding questions precluded the development of a regional oil spill cooperative.

In early 1994, RCAC and Alyeska met with the Alaska Fish Spotters Association (AFSA) and discussed how best to incorporate the use of fish spotter pilots and their local knowledge into nearshore response. Alyeska and AFSA are continuing discussions on development of a more formal relationship. RCAC is encouraged by these steps and looks forward to the concepts being addressed by the shipping companies for use in long-term response.

In the spring of 1994, both industry’s and the state’s prototype barges will undergo Alaska sea trials. RCAC will be carefully evaluating these options to see if they address the problems left unresolved by the existing spill response capability in RCAC’s region: the need to equip and train local residents to respond to spills, especially in the area of nearshore response oil storage, and the need to effectively organize, train, and use the capabilities of the local fishing fleet and other local resources.