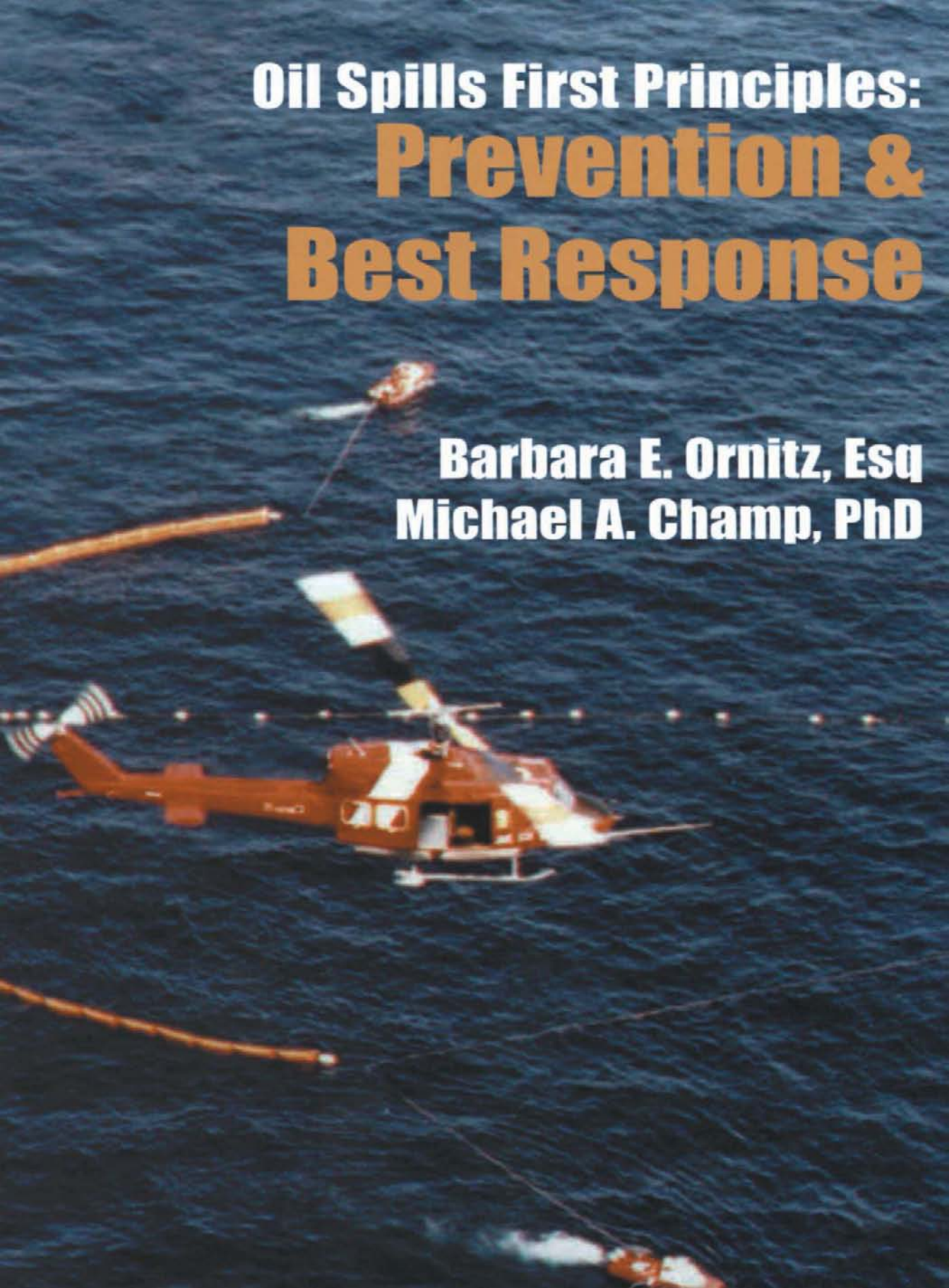
Oil Spills First Principles:
Prevention & Best Response

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OIL SPILLS FIRST PRINCIPLES: PREVENTION AND BEST RESPONSE

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Oil Spills First Principles: Prevention and Best Response

BY

BARBARA E. ORNITZ

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Preface

The **Oil Spills First Principles** are: *Prevention* which is based on the Safety Culture, and *Best Response*, which is based on science and engineering.

Prevention

The challenge for the maritime industry in this millenium is whether those involved in the transport of oil will embrace the concept that the "safety culture", which includes protection of the environment, is "good business". Ship owners/operators and others in the maritime business will adopt the safety culture when they believe in a "continuous and never-ending improvement process as a means to promote productivity and profitability" (Evans, 1999). The primary principles of oil spill response are referred to as the **Oil Spills First Principles** and they are **"Prevention"** and **"Best Response"** to reduce environmental and economic impacts when spills happen. "Sustainable shipping", for companies with a viable future, requires acceptance by those in the maritime industry of each of these principles.

What this policy shift means is that proactive safety management, quality systems with accountability at all levels, trained and qualified mariners and the use of right technology at the right time in a response replace short-term profit maximization and crisis reaction. Safety saves dollars.

The question for the industry in this next century is which choice will the ship owners and operators make? Will they simply comply by doing only what is expected of them, or will they adopt the "safety culture". Ship owners need to understand the options and choices and the long-term economic values of implementing the safety culture. Det Norske Veritas, (DNV) one of the three largest classification societies worldwide, has undertaken a systematic analysis of the current industry attitude toward proactive safety and environmental concerns. DNV classifies these views into three cultures:

- The *Evasion Culture*: companies who do not take recognized international standards seriously and even have a good feeling when succeeding in evading them.
- The *Compliance Culture*: companies who do what is being expected of them.

- The *Safety Culture*: companies who believe in a continuous and never-ending improvement process as a means to promote productivity and profitability" (Ullring, 1996).

"The goal of the maritime industry should be to develop a safety mentality in all those engaged in shipping oil. The current more passive, inspection culture relies upon regulatory inspections to find the "problems", fixes the symptoms without determining what the true root causes are, and reacts with suspicion and disbelief toward regulators. The regulators in turn depend heavily on the traditional system of primarily technical compliance, through inspection. The safety culture requires a continuous learning process, incorporating lessons learned, and addressing root causes. The indirect effect of these is protection of the environment.

The motivators for the maritime industry are economic, policy based, and legal. Oil spills result in tangible, direct losses in life, injuries, damage to the environment, cargo, and vessel. Direct costs measure only part of the total. Indirect and hidden costs are harder to quantify. They include, for example, reduced worker morale and productivity, eroding customer base, and in this litigious age, natural resource damage assessment, economic loss claims, increased insurance costs, fines, imprisonment of Chief Executive Officers and loss to the corporation for their services, public notoriety, lost opportunity, and many other similar losses. The indirect/hidden costs equate to an increase in direct costs, using a *conservative multiplier of 2.7 to 1*. For every dollar spent on the direct costs, $3 will be allocated to indirect costs. Estimates of the total cost of all categories for all vessels involved in marine incidents annually are between *$581 million to $1 billion* (USCG, 1997). Conversely, high quality safety management yields cost savings annually for the industry of between $500 million and $1 billion, or an average for individual companies of $200 thousand (USCG, 1997). "True cost accounting" (measuring all costs, external, internal, hidden) translates to a better bottom line.

True cost accounting exposes only the tip of the "accident cost iceberg", with only direct costs being visible and easily identified (Ullring, 1996). But, the real loss to industry remains in the hidden and less identifiable costs. The most aptly stated conclusion to be drawn from such a complete reckoning is found in the oil response adage: "an ounce of prevention is worth a pound of cure". Industry can use the data about the cost of accidents to determine cost savings resulting from successful implementation of a comprehensive accident prevention program. Safety management programs not only help humans and the environment, they can also translate to a better company bottom line (Ornitz, 1996).

Safety management is closely linked to quality management. Implementation of quality management saves money, by giving the leaders and directors of a company the ability to strategically plan for safety. By using a systematic safety approach, a manager can decrease the otherwise large gap between analysis and performance standards and can produce a workable, strategic plan for safe operations. Randall

Gilbert (1997), a maritime consultant and former co-founder of the Center for Maritime Leadership, has made a subjective study of the cost/benefit ratio for companies invested in "optimum", and not just minimum regulatory safety strategies. Gilbert's conclusions support the working hypothesis that safety is good for business and that self-regulation pays:

- As safety decreases below minimum regulatory standards, the costs incurred to the company increase exponentially.
- A composite curve depicting the costs to create a safety management system and the benefits accruing to the company from such a system reveals an overall advantage from using a safety management strategy at the "optimum" level of safety (above regulatory minimums). As the safety index increases, the reductions in losses outweigh the costs incurred to achieve the higher safety standard.
- A safety system at higher than minimum levels controls cost variations. These variations exist at all levels, but are of less impact in a functioning optimum safety system. An example of an uncontrolled "variation" is the effect upon safety and performance of a brand new mate showing up on board a vessel new to him. The old way of handling this situation was by the "school of hard knocks", letting the mate learn the ship on his own. The quality management system solution minimizes the potential for negative consequences by providing the mate with a positive, well thought out orientation of the ship and his job. Gilbert's rule used is "no assumptions—no mistakes" (Gilbert, 1997).

The players in the business of shipping can be viewed as interrelated parts in a greater whole. Their objective is to protect the safety of their mariners, prevent pollution of the environment and make money while moving oil and other products around the world. These partners include every facet of shipping. Their interrelationship has been characterized by a series of safety nets surrounding the vessel. In concentric rings, flowing from the innermost to the outermost circle are those responsible for safe tanker shipping:

- Owners and operators;
- Flag States;
- P&I Clubs, insurers;
- Classification Societies; and
- Port States (Voogel, personal communication, 1999).

The International Maritime Organization (IMO) is the world organization tasked by the United Nations with dealing with the shipping industry, in the principle areas of safer shipping and marine pollution control. The organization's slogan is "Safer Shipping and Cleaner Oceans" (IMO, 1998). IMO emphasizes that each interest in the safety net must be involved in the implementation and enforcement of appropriate international rules and standards in order to eradicate substandard ships and prevent accidents. "It is the joint responsibility of administrations, ship owners, classification

societies and all those involved in the day-to-day operations of ships to see that ships conform to the internationally agreed standards, that they are well run, well maintained and do not pollute the marine environment . . . " (IMO, 1997a).

What is the ultimate importance of the safety net, with its responsible party links composing these various subsets of chains? The goal is that the substandard operators will be out of the trade and that those remaining will operate a healthy, self-regulating, quality business of shipping worldwide (Voogel, personal interview, 1999).

The Commission of the European Communities has eloquently summarized the call for a safety culture in its recent Communication to the Parliament. After analyzing the weak links in these chains, the Commission poses this challenge to the tanker industry: "What is needed all-in-all is a package of measures which will bring about a change in the culture of the tanker industry. There should be stronger incentives for quality minded carriers, charterers, classification societies and other key bodies. At the same time, the net should be tightened around those who seek short-term personal economic gain at the expense of safety and the marine environment" (Commission of the European Communities, 2000).

On a policy level, those companies that are members of the "evasion culture", cut corners, shave costs, evade regulation and fudge on safety, face increasing risk and smaller arenas for business. Those companies which merely comply with minimum regulation and depend upon responsible agencies to enforce the body of law, also face increasing risk. In contrast, those companies that embrace the safety culture, reduce risks and find that protection of humans and the environment is good for business are the companies of the future.

Oil spills result in tangible, direct losses of life, injuries, damage to the environment, cargo and vessel, loss of time, loss of consumer base and many indirect costs. Perhaps most significantly, a spill can mean loss of freedom due to criminal imprisonment. Oil spills are no longer considered an unavoidable "accident" of environmental conditions or a function of catastrophic events (ITOPF, 1999; USCG, 1995).

The international community, through the International Maritime Organization (IMO), has embraced the approach that the chief factor in accidents is the human element and that a change in attitude, adoption of the "safety culture" with its focus on people, is the most productive way to prevent shipping incidents (IMO, 1997).

Significant changes in the regulatory structure embody the new concept of the "safety culture":

- The entry into force of the International Safety Management Code (ISM Code), Chapter IX of the Annex to the International Convention for the Safety of Life at Sea (SOLAS) which became effective July 1998 for much of the oil carrying fleet.
- Amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), placement of technical requirements into a new STCW Code (STCW 95 amendments) with emphasis upon

creating an international minimum standard of competency. For the first time in its history, IMO acts as the reviewer of flag administration systems to ensure that the Flag State's mariners have been trained and certificated properly.

- Other amendments to SOLAS and to The International Convention for the Prevention of Pollution from Ships, 1973, with its 1978 Protocol (MARPOL 73/78). These provide greater authority for Port State Control officials to inspect ships not only for technical compliance, but also to assess the ability of the ship's crew to perform operational requirements consistent with their duties.

The US has adopted these international treaties and taken another step in the movement against substandard shippers. With the advent of OPA 90 in the US (found in Pub. L. 101-380, 18 August 1990, 33 USC Sec. 2701 et seq.), and its insistence upon the concept that "the polluter pays" not only for the actual costs of a clean-up, but also for damage to the public's natural resources, the safety culture has become a technological and political imperative for the maritime industry.

Civil and criminal statutes in the US and internationally motivate the cultural shift. The emerging legal theme for the year 2000 and beyond is "environmental crimes". Oil spills have become serious business in the US and internationally and equate to real costs for companies sued for oil pollution. Management at the top is becoming the target of criminal investigation. Responsibility for spills affects not only the lowliest mate. Liability touches the Chief Executive Officers of the Responsible Party company, subjecting individuals at all levels to potential imprisonment and large fines. The *Morris J. Berman* oil spill in San Juan, Puerto Rico of almost 798,000 gallons of No. 6 diesel fuel resulted in the largest criminal environmental fine in US history, $75 million, the seizure of some $19.5 million in assets of the three individual companies involved and also of the parent company, and house arrest of the managing agent (*US v. Bunker Group*, No. 95-84 (HL) (D. P.R., 25 September 1996). The agent's sentence was later overturned on evidentiary grounds, but the legal doctrines affecting the liability and assets of the corporations remain settled law (*US v. Rivera*, 131 F. 3d. 222, 1st Cir. 1997).

Aggressive litigation on the part of the US Department of Justice (DOJ) and individual state environmental crimes departments has led to numerous actions, fines and sentences: for example, the *North Cape* spill in Rhode Island on 18 January 1996, with its resulting $7 million criminal fine against three companies, additional $1.5 million payment to purchase ecologically sensitive land, $1 million to upgrade safety on ships, $20 million in clean-up costs, and probation for the company president of Eklof Marine and Master of the *Skandia*; (*US v. Eklof Marine Corp*, No. 97-075 (D.R.I., 25 September 1997), No. P2-97-3244-A (RI Super. Ct, 1997); the *Royal Caribbean Cruise Line* (RCCL) case with its $8 million criminal fine for the Puerto Rico Case and $1 million criminal fine for the Miami, Florida case (*US v. Royal Caribbean Cruises, Ltd*, et al., Crim. No. 96-333 (PG) (D.P.R.), Crim. No. 98-103-CR-Middlebrooks, S.D. Fla. 1996), the fine of $18 million for more stat-

utory violations against RCCL (OSIR, 1999a), and the latest case against RCCL for pollution activities in Alaska leading to a $3.5 million settlement (OSIR, 2000).

Internationally, various courts have entered a series of fines and imprisonments for environmental offenders, even including criminal proceedings against senior harbor managers and the port authority of Milford Haven for the 1996 *Sea Empress* grounding in Wales around the Milford Haven port and the subsequent 21 million gallon crude oil spill. The Port Authority was fined $8 million (OSIR, 1999b). This fine was reduced at a later date to US$1.8 million (OSIR, 2000a).

Adoption of the safety culture with its continuous improvement process promotes profitability. "True cost accounting", measuring all costs associated with a marine incident, direct, indirect, and hidden, is not insignificant in terms of the future of the maritime industry. Substandard operators who refuse to adopt the safety culture cannot afford to sustain losses of the type enumerated above. If not put out of business by their peers or by regulators, fines and criminal imprisonment, one significant spill may mean that their business operations cease. This is the bottom line reality of true cost accounting. The other side of the adoption of the safety culture is the sustainability of the maritime shipping industry.

Best Response

In the US, the *Exxon Valdez* oil spill significantly influenced the development of OPA 90 (Oil Pollution Act of 1990) and the need for *Best Response*. Since then, subsequent US regulations have been influenced by the smaller spills: the *Berman Barge* spill (1994) off San Juan, Puerto Rico and the *North Cape* spill in January 1997. These spills have raised public awareness about the safety of US waters and shaped the legislation and regulations that establish liability of the responsible party, the spiller, response, clean-up operations, and environmental damage assessment. Oil spills are no longer considered an unavoidable "accident" of environmental conditions or a function of catastrophic events. These changes are related to:

- Changes in public opinion;
- Environmental damage from inappropriate technologies;
- Costs of environmental damage;
- Costs of clean-up and response;
- Liability being redefined in the courts (with guilty parties being fined and serving time); and
- Better integration of science, policy and contingency planning, training and oil spill response and decision making.

These changes have occurred because federal and industry research and development programs have better established the basic principals underlying the relationships between the fate, behavior and effects of spilled oils and the relationships of

the weathering of spilled oils to effectiveness of response technologies. In the past, the lack of a scientific basis for selecting oil spill response technologies promoted "Reasonable" or "Best Available Response". However, today, the public, policy and decision makers, responders, oil companies and tanker owners desire "Best Achievable Response". Best Response (which is Best Achievable Response) mandates that decision making in oil spill response be:

- Scientifically based;
- Technically and environmentally the correct response;
- Able to integrate in real time a wide array of data and information; and
- Reflective of a process of extensive preplanning and training at all levels.

Oil Spill Response

Oil spill response is an extremely complex and challenging cross-disciplinary experience. In the operational decision-making process, it combines a wide range of issues and activities under emergency response conditions that include: the nature of the material spilled, which undergoes changes in physical and chemical properties (weathering) and biodegradation over time, local environmental conditions, sensitivity of impacted natural resources, and selection and effectiveness of response/clean-up technologies.

Planning and decision making in oil spill response requires an understanding of oil weathering processes and the subsequent changes in an oils characteristics and the effect of these changes on response technologies over time. These changes have an important influence on the usefulness and effectiveness of response methods and technologies. Four major categories of response (clean-up) technologies are available:

- Chemical treatment (dispersants, emulsion breakers);
- In-situ burning;
- Mechanical recovery (booms, skimmers, oil-waster separators, adsorbents; and
- Bioremediation (including chemical).

Technology Windows-of-Opportunity Concept

The *technology windows-of-opportunity* is defined as the various time periods for effective utilization of marine oil spill response technologies and methodologies in clean-up operations.

The delineation of technology windows-of-opportunity is a new approach where science and engineering data and information are integrated to provide a scientific foundation for rapid decision making in oil spill planning and response, to optimize environmental and cost benefits by the selection and use of different oil spill response

technologies and methodologies. The concept utilizes the following datasets: (1) dynamic oil weathering data for selected oils; (2) actual environmental data; and (3) dynamic performance data of oil spill clean-up technologies.

Recent studies have found, that the time period available for response within a window-of-opportunity, will vary with environmental conditions, oil type, and the degree and rates of changes in oil properties (Nordvik, 1995a). Changes in oil properties as a function of time can be measured by use of a stepwise oil weathering method. This weathering method determines changes in evaporation, density, viscosity, pour point, flash point, and emulsification at different degrees of distillation, (weathering) representing different time intervals of spilled oil. A graphical presentation of these data can be plotted by the IKU Dynamic Oil Weathering Model (Aamo et al., 1993).

The two dominant processes that cause changes in oil characteristics over time are evaporation and emulsification, which significantly increase the viscosity of spilled oil. In this paper, viscosity is used as a time reference for estimating the window-of-opportunity for dispersants and mechanical recovery equipment including sorbents. Density is used as time reference for density differential oil water separators and emulsification (water content) is used for booms and in-situ burning.

Evaporation of the more volatile components and the formation of a water-in-oil emulsion during weathering occur simultaneously during and after a spill. The rate and extent to which they proceed depends on the chemical composition of the oil and prevailing environmental conditions (such as wind speed, seawater and air temperature, and sea state). The relationships between these factors and the changes in key properties during weathering have to be well understood as well as the effectiveness of specific response technologies under these conditions, in order to estimate and delineate windows-of-opportunity for specific clean-up methodologies and technologies. Therefore, to achieve maximum environmental and cost benefits in implementing response strategies, response tactics and technologies must be chosen to fit the technical windows-of-opportunity.

Recent studies of oil weathering, and the influence of such weathering on performance and effectiveness of specific response technologies (equipment), provide the necessary data to make it possible to identify windows-of-opportunity. The delineation of these windows then facilitates the optimization of different response technologies and strategies. An overview of data and information requirements related to the window-of-opportunity concept is presented in Figure 1.

Methods and technologies in each of these categories are limited by environmental conditions both operationally and as a result of the changes in oil characteristics over time. Effective use of dispersants, in-situ burning and some mechanical technologies is limited in time and governed by changes in oil properties. The most efficient, environmentally preferred, and cost-effective spill response is dependent on the following factors:

- Chemistry of the spilled product;

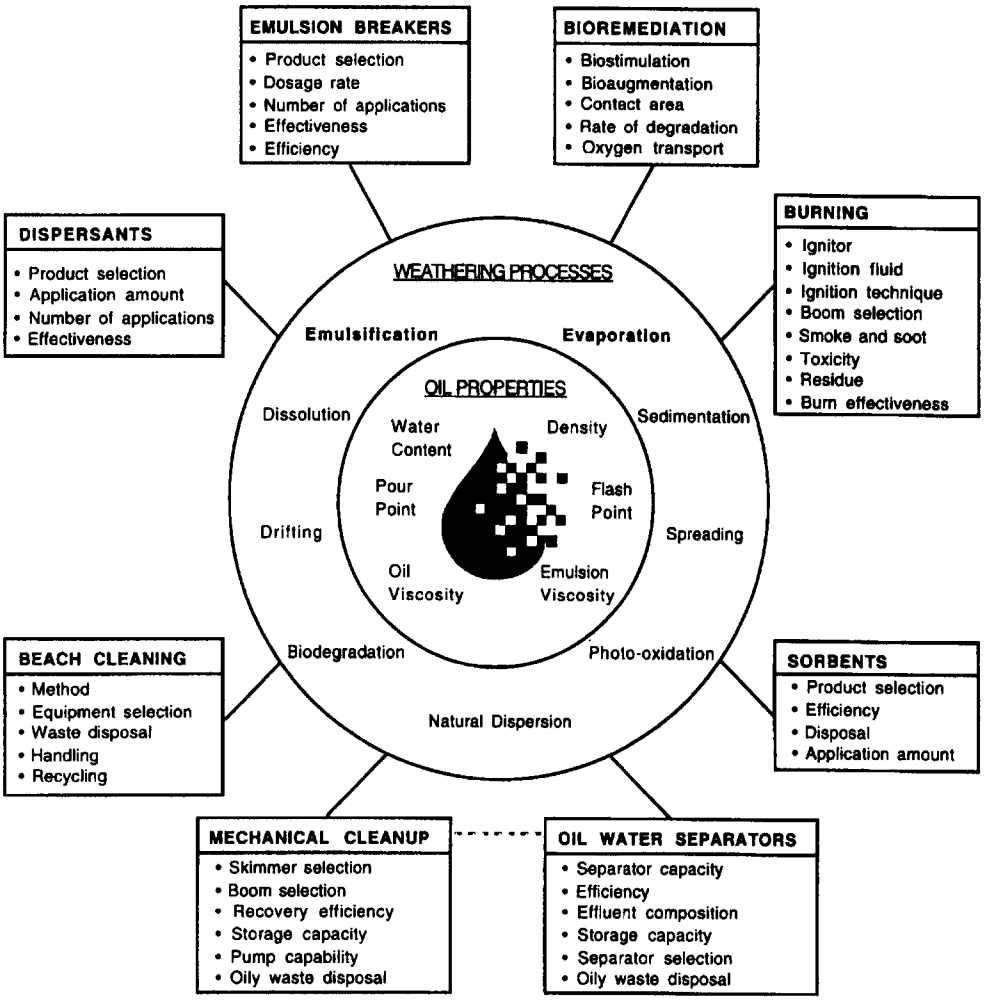


Fig. 1. Oil weathering processes impacts the effectiveness of selected technologies for oil spill response.

- Quantity;
- Location;
- Response time;
- Environmental conditions; and
- Effectiveness of available or prepositioned response technologies

Oil Weathering and Technology Performance

To enhance the effectiveness of clean-up operations, decision makers need a rapid and accurate tool for predicting changes in oil properties, and a dynamic database contain-

ing data and information on the capabilities, capacities, effectiveness, and limitations of response technologies and methodologies. Dynamic oil weathering models have been developed for use in contingency planning and response decision making. Their reliability and operational output values have greatly improved over the past several years. This progress is a result of advances in model development, data quality and quantity.

Decision making in oil spill response requires an understanding of oil weathering processes and subsequent changes in the characteristics of the spilled oil over time. These changes have an important influence on the usefulness and effectiveness of response methods and technologies. Three major categories of response (clean-up) methods are available: (1) mechanical recovery; (2) chemical treatment; and (3) in-situ burning. Methods and technologies in each of these categories are limited by environmental conditions both operationally and as a result of the changes in oil characteristics over time.

Dynamic oil weathering models have been developed to predict changes in oil properties over time and have been used as a decision-making tool in actual spill and spill scenario over the past several years in particular to assess use of dispersants. Integration of a technology database, using changes in specific oil characteristics as a time reference has further improved decision-making capabilities.

In addition to dispersants, effective use of in-situ burning and some mechanical technologies is limited in time and governed by changes in oil properties. The most efficient, environmentally preferred, and cost effective spill response is dependant on the following factors: chemistry of the spilled product, quantity, location, response time, environmental conditions, and effectiveness of available response technologies (given the first five factors). Utilization of multiple response technologies requires a rapid and scientifically-based decision-making tool and an integrated system of response capabilities.

Oil spill response management in the past decade has evolved advanced remote and mobile systems to collect data and information and transmit them directly from the spill to response policy and decision makers. These new scientifically-based tools, can integrate several data sources, to bring together the impact of weather, sea state, wind, current and water temperature, the physical and chemical properties and characteristics and trajectory of the spill oil for identification of the time periods that specific response methods and technologies are most effective.

Oil spill response decisions (or lack of) made immediately (and in the first 4–48 hours) after a marine oil spill has occurred can be the single largest factor that will influence the total cost of oil spill response and the degree of environmental impact.

Major oil spill incidents over the past decade have led to development of more specific and stringent requirements and regulations in many countries around the world, followed by establishment of response organizations using clean-up methods, ruled by governmental policies and environmental concerns. Response methods are therefore quite varied among the countries around the world, even for the same spill

of oil. The ability of a spill responder to use the best science and the most effective response methods in dealing with oil spills has been quite limited.

Ideal marine oil spill response strategy and tactics should focus on the use of the most rapid, efficient and cost-effective response methods and technologies. Use of the most effective response method and technologies require access to reliable, national and international accepted data, based upon a scientific and engineering approach. The windows-of-opportunity concept, with the combined information from dynamic oil weathering model and performance technology databases can become a decision-making tool identifying and defining the window of effectiveness of different response technologies (methods and equipment) under given environmental conditions.

Why Cartoons?

Cartoons have been reproduced throughout this book, not to de-emphasize the seriousness of the content of the book, but to demonstrate the power of an illustration (as an editorial) for presenting information, ideas, and concepts and for the reader to consider the influence that they had on OPA 90 in the US.

Champ and Park (1989) first used cartoons in the book *Marine Waste Management: Science and Policy* and Champ (1990) published an article in *Oceanus* at Woods Hole Oceanographic Institution on the impact of cartoons on the regulation of marine pollution. It was felt that cartoons contribute an artist's interpretation of society's beliefs, moods, or knowledge. Pollution cartoons reflect the reality of society's fear of catastrophic degradation of the marine environment by mankind; and in a sense, this fear is in itself a reality that policy and decision makers must deal with when developing regulatory strategies. Cartoons are also a constant reminder that research cannot be an end to itself; the effort to inform the public is at least as important as the research itself.

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The regional offices of the USCG Public Affairs Office has over the years collected many cartoons related to oil spills as a measure of public interest. We appreciate the various cartoonists and newspapers that have been so gracious in allowing us to reproduce these cartoons in the interest of illustrating the subtle and not so subtle impact that they had on public interest, perception and policy and regulation as related

to oil spills. We would like to thank Dr. Robert Browning, Jr., the USCG Historian, who assisted us in locating these cartoons.

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In addition, we would like to acknowledge those authors that have written and published formal books relating to oil spills and oil spill response (listed below). We would like to recognize their efforts to bring together the available knowledge and experience base of all those involved in the oil spill response community in preventing and responding to oil spills. Many dedicated individuals have spent years in summarizing their and others experiences and life's work and these efforts cannot be acknowledged enough for their contributions. It takes years to prepare and publish such reference works. These publications include the following books:

Fingas, Mervin F. 2000. The Basics of Oil Spill Cleanup, Second Edition. CRC Press, Boca Raton, FL, 256pp.

Cormack, Douglas 1999. Response to Marine Oil Pollution—Review and Assessment. Kluwer Academic Publishers, London, 385pp.

Burger, Joanna 1997. Oil Spills. Rutgers University Press, New Brunswick, NJ, 260pp.
Husain, Tahir 1995. Kuwaiti Oil Fires: Regional Environmental Perspectives. Pergamon, Oxford, 292pp.
Doerffer, J.W. 1992. Oil Pollution Response in the Marine Environment. Pergamon Press, Oxford, 391pp.

Following September 11, 2001, we realize that the oil spill response community due to its experience and expertise has a unique contribution to bring to the new emergency response community and that this will greatly expand the service provided by our community. We hope that the efforts to produce this book contribute to Prevention and provide for Best Response when oil spills occur. These are the First Principles of Oil Spill Response.

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Michael A. Champ

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Chapter 1

The Problem—Oil Spills

Oil spills present a unique public dilemma. Statistics indicate that human error causes 80% of the major oil spills. Society and economic development require the economic benefits from selling and transporting oil. While consumers experience these benefits from available oil, the negative impacts from spilled oil are far-reaching, economic, social and environmental. These are in addition to the money spent on the clean-up response, which may be passed on to the consumer subsequently. On a global basis, the size and number of oil spills are declining. As a source, these spills fortunately represent less than 5% of the oil contamination in the global oceans. But, even this limited percentage of pollution represents a concentrated point source that can significantly affect certain marine ecosystems.

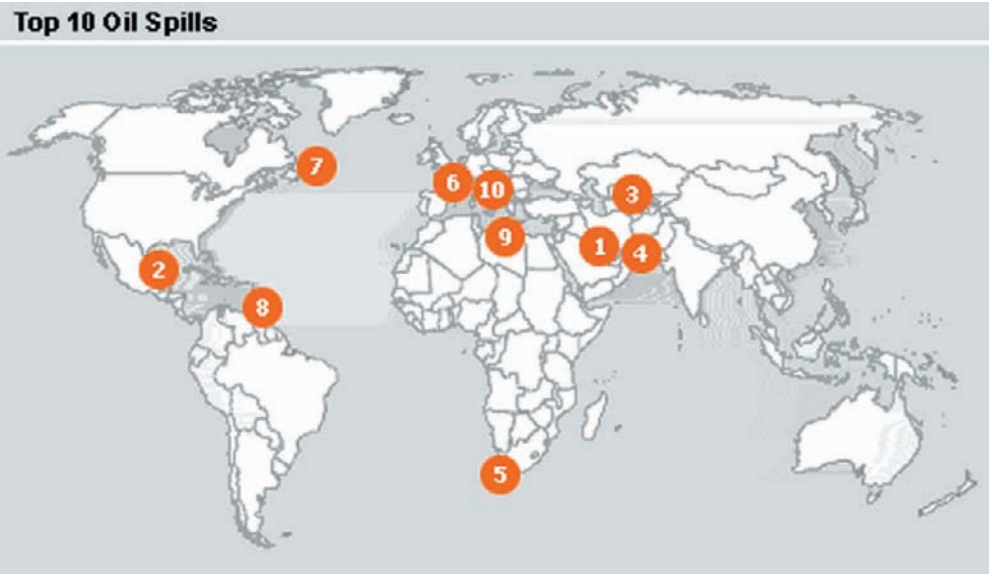


By Wright, *Providence Journal Bulletin*, reprinted in *The Alameda Times-Star*, July 7, 1989.

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Data suggest that low energy coastal ecosystems, such as wetlands, marshes and beaches may need 50 years to fully recover from the impact of an oil spill. On a global basis, response to oil spills and clean-up can be quite different depending upon who pays for it and the extent of the clean-up. The concept of the "polluter pays" is the major difference between the International and US regimes. The complete concept as interpreted in the US under OPA 90 includes the costs for the clean-up and full restoration of the environment. The oil transporting industry is a global and Flag State based industry that is required to adhere to both national and international regulations and recent changes in public perception. The industry would prefer to have greater limitations of liability for clean-up and to use "natural" restoration processes over time for full restoration of the environment. However, with the world's population estimated to double by 2050, which subsequently should double the volume of oil transported and the number of tankers and spills, the international viewpoint may not be good for business in the future, because of the undergoing change in public acceptance of this damage to the marine ecosystems.

If, in the future, the number of choke points and high-risk spill zones stays the same, the probability of the number of spills and the annual volume of oil spilled in specific areas will increase as well. The effect of this increase is that certain ecosystems will be in some state of constant degradation, either being impacted or in recovery from oil spills. Unless we can delineate the root-causes and risk factors for oil spills to prevent these spills in the first instance and integrate better science and engineering into planning, training and response processes, the world's coastal marine resources will be seriously degraded over time.



Sites of top 10 oil spills.

The current legal, regulatory and convention framework affecting the transportation of oil by ship reflects a recent change in public attitude, which mirrors this dilemma, an insistence upon protection of the world's marine environments, and in particular, coastal ecosystems. This public concern places those linked to shipping in a position of making crucial decisions, which may well determine their future ability to conduct business.

There are significant legal and political motivators for a cultural shift by the industry, from an "evasion" to a "safety" culture. Those ship owners/operators who cut corners, shave costs, evade regulation and fudge on safety are facing a smaller and less rewarding arena in which to operate. Even those companies, which merely comply with minimum regulation and depend upon the responsible agencies to enforce the body of law governing the business of oil transportation, are finding themselves in positions of increasing risk. The new "safety" culture connotes continuous improvement in ship operations and a willingness to adopt the evolving safety culture concepts and a paradigm shift from the freedom of the seas. The high costs, (whether the consumer or the polluter experiences them) including environmental damages, from oil spills mean that the shipping industry must incorporate good science into each stage of decision making, in oil spill prevention and response.

1.1. Freedom of the Seas—Developing Law

For as long as ships have sailed the seas, man has done so with impunity. The "Right of Passage" through territorial waters has guaranteed the "freedom of the seas" (*mare liberum*) across the world's oceans. Until the recent past, the only judicially recognized constraint on maritime conduct was that established by international customary law, the principle that a nation (state) should *not* conduct its maritime business on the oceans in such a way as to *abuse the rights* of another nation. The growing recognition that ocean resources are not inexhaustible and that pollution poses a threat to marine ecosystems led to the development of national and international regulations for the transport of oil and the prevention of oil pollution. The first attempt to codify the Law of the Sea and create some limits upon this unfettered freedom occurred in a series of United Nations Conferences, which concluded in 1958 in Geneva. The conference resulted in the expression by treaty of two competing concepts:

(1) *Convention on the High Seas* (UN, 1958a) assured the supremacy of the Flag State, giving each nation freedom of navigation, the right to extend sovereignty to vessels registered under its flag, and absolute jurisdiction over their design, manning, and standards, as well as the right of enforcement of any legal or disciplinary process in the event of an incident of navigation on the high seas. To effectuate this treaty, states were to craft national regulations to prevent pollution of the seas.

(2) *Convention on the Territorial Sea and Contiguous Zone* (UN, 1958b) qualified this absolute regime by establishing the basic rule of limitation: "right of innocent passage". Passage through territorial waters of a state is guaranteed "so long as it is not prejudicial to the peace, good order or security of the coastal state". Even with the confirmation of "innocent passage" as an expressed principle, the two warring interests between Flag State supremacy and Flag State obligations continued. The primary concern affirmed by this Convention was that such passage not be "hampered" leaving enforcement of local regulation to a subsequent time and method other than direct interference with the vessel (Guruswamy et al., 1994).

Initially at the UN, the early focus on marine pollution was from ships, in which the concern was from the discharge of oil in bilge waters at sea. This led the UN to create the Intergovernmental Maritime Consultative Organization (IMCO) in Geneva in 1948. IMCO was subsequently renamed the International Maritime Organization (Convention effective as of March 1958). The Convention delegated to IMO the task of administering appropriate international treaties concerning pollution from oil and other substances from vessels. This administration includes among other tasks, facilitating intergovernmental cooperation, exchanging information on technical matters affecting shipping, and ensuring high standards of maritime safety. IMO generated conventions that form the framework for subsequent regimes governing international prevention, response, enforcement, and compensation for oil spills. These conventions are the subject of discussion in Sections 3.5, 4.2 and 4.3 of this book (IMO, 1998a).

The 1982 *United Nations Convention on the Law of the Sea* (UNCLOS) was the first comprehensive international agreement on the marine environment and the first real codification of then customary international law (UN, 1982). UNCLOS balanced the competing interests of coastal states and maritime nations. UNCLOS clarified the meaning of "innocence" in the phrase "right of innocent passage" to include among those activities considered prejudicial to a coastal nation, "willful and serious pollution" of its waters. Recognizing the "hybrid" nature of seas and oceans, that they are both global and national, UNCLOS mandates a regime that ensures that activities of states will not pollute the environment of other states beyond their sovereign jurisdiction. Nations must control all sources of pollution, including pollution from vessels caused by both intentional and unintentional discharges. The convention expanded the concept of global sovereignty and granted countries greater jurisdiction over their coastal waters to include the 200-mile Exclusive Economic Zone (EEZ) for research, exploration and preservation of natural resources (Champ, 1984, 1984/1985). UNCLOS designated global authority over seabeds, making nation states responsible for their environmental protection.

Of equal significance for future pollution control, UNCLOS created a clear concept of Port State control. Each coastal state has the right to adopt laws and regulations to

preserve its environment, prevent, reduce, and control the pollution. Therefore, Port States can enforce rules against environmental damage to the oceans no matter where such damage occurs, once a ship voluntarily enters that country's port. This right is balanced by dispute settlement requirements involving control by the Flag State when a vessel flying its flag is alleged to have acted contrary to the treaty provisions for rights of navigation and preservation of the environment. UNCLOS entered into force on 16 November 1994.

UNCLOS was an important first step in international law, or the body of rules that governs relations between states. The Law of the Sea Conference started a process of consensus building whereby participating nations reached "final agreement by consensus," using the "power of international cooperative effort" (Clingan, 1992). IMO has continued this important precept to create the current regulatory body of law, which governs the oil shipping industry today. Subsequent treaties expanded control over marine pollution, which UNCLOS began, in three important areas:

- Standard setting;
- Enforcement of global provisions internationally and nationally; and
- Dispute settlement through international forums (Guruswamy et al., 1994).

The historical dispute between the competing principles of open seas and restricted travel, between Flag State and Port State jurisdiction, exists today. However, increasingly, since passage of UNCLOS, preservation of the environment has framed the debate and set the benchmark for regulation of foreign ships passing through coastal states' territorial waters. The legal framework of international conventions and US laws and regulations affecting the shipping industry reflects a change in public attitude about liability for oil spills.

1.2. Major Oil Spill Rates

Comparing data from several published sources (NRC, 1985; Anderson and LaBelle, 1994, 2001; DeCola, 1999) for the number of major oil spills (100,000 gallons or more/700 tonnes or more) and quantity of oil spilled with statistics from 10 to 25 years ago, lead to a positive conclusion that prevention strategies, regulations and treaties are working. The volume of oil spilled and the number of large spills are decreasing worldwide.

Globally, the data reported by national and international sources indicate a dramatic *decrease* in oil spills from ships, with a reported reduction of as much as 60% during the past 25 years, according to a study performed by the US National Academy of Sciences in the United States (NCR, 1985; Anderson and LaBelle, 1994, 2001; IMO, 1998a).

In addition, data from the International Tanker Owners Pollution Federation (ITOPF) databases also support this general assertion. ITOPF, has maintained a data-

base of oil spills from tankers, carriers and barges since 1974. According to this database, the trend is toward decreasing spills:

- *Number of spills:* Per ITOPF figures, major spills of 700 tonnes or more have decreased. By the end of the 1980s the average number of major oil spills each year had dropped to one-third of that witnessed in the previous decade. From 1970 to 1979 there were 24.2 spills per year average, compared to 1980–1989, with an average per year of 8.9 major oil spills. From 1990 to 1997, this figure decreased further to 7.8 spills per year (Moore, 1999).
- *Quantity of oil spilled:* The vast majority of spills is less than 7 tonnes, and as such considered small spills. The data are incomplete for these types of spills. For spills greater than 7 tonnes, annual estimates are available for oil spilled. The comparison shows reduced quantity of oil spilled. For example, in 1970, 301,000 tonnes were spilled compared to the 1998 figure of 10,000 tonnes for spills greater than 7 tonnes. It is difficult to judge the comparative impact of regulation and prevention activities over a period of time, because any one incident can skew the data. For example, in the 10 years from 1989 to 1998, there were 366 spills of more than 7 tonnes per spill, which produced a total oil volume of 1,251,000 tonnes. However, 893,000 tonnes or 71% of the total came from 10 incidents, or less than 1% (ITOPF, 1999).

In the US, several distinct databases confirm the same trend of significant reduction of oil spilled for US waters. These sources include:

- US Coast Guard (1999) figures from 1982 through 1998, and 1999;
- American Petroleum Institute's (API) comparison of spills between 1987 and 1996;
- Cutter Information Corporation's Oil Spill Intelligence Report (1998) tracking of oil spills from 1962 through 1996; and
- INTERTANKO (1999), International Association of Independent Tanker Owners.

The findings can be summarized best as follows: All studies show a downward trend in oil spills in the US, specifically:

- Since the passage of OPA 90, the gallons spilled per million gallons of oil and chemicals shipped have decreased. The gallons spilled per million shipped have been reduced from an annual average of 14 gallons for the years 1983–1990 (pre-OPA) to 5 gallons spilled per million shipped from 1991 to 1998, a decrease of 64% according to US Coast Guard figures (Williams, personal interview, 1998, personal communication, 1999). Also, the average number of oil spills over 10,000 gallons has dropped by approximately 50% from pre-1991 levels. From 1994 to 1997, 1.5 gallons of oil were spilled per million gallons shipped. The annual oil spill volume from tanker ships, which contributes about 75% of the

volume spilled, remained below 200,000 gallons for each year from 1991 through 1995 (USCG, 1997, 1999a).

- The most recent analysis, completed by the US Coast Guard in November 1999 indicates continued decreasing numbers of spills and amount of oil spilled in US waters. In spite of increased consumer demand, a review of statistics from the years 1973 through 1998 reveals a steady downward trend in oil spills in the US and in the volume of oil spilled. The significant findings are: (1) that 87% of all spills in this time period are between 1–100 gallons; (2) over 76% occurred on internal waters out to three nautical miles offshore; (3) of volume spilled, tank vessels generated almost 47%; and (4) the predominant oil spilled is crude or heavy oil, accounting for 62.5% of the total volume spilled (USCG, 1999b). These data are available on the Internet at the following URL: http://www.uscg.mil/hq/g%2dm/nmc/response/stats/aa.htm
- API (1998) reports a downward trend based on a 10-year comparison. From 1987 to 1991, the spillage from transport vessels decreased about 81%: an annual average of 5,943,000 gallons of oil spilled from freighters, barges and tankers in US waters, compared to an annual average of 1,142,000 gallons from 1992 to 1996. Tanker spills declined from an annual average of 4,010,000 gallons between 1987 and 1991 to 160,000 gallons from 1992 to 1996 (for a 96% decrease). Barges decreased oil spillage in the same comparative time frame by 51%. In 1996, the number of oil spills reported declined by about 10%, by more than 900.*
- Cutter Information Corporation's (Etkin, 1998) analysis of oil spills in US waters supports the same downward trend. Of a total of 195 tanker spills between 1960 and 1996, or almost 180 million gallons, 1996 accounted for 5 spills of 381,000 gallons (1296 tonnes). In the same 36-year period, 284 barge spills released almost 48 million gallons of petroleum into US waters. In 1996, seven barge spills released only a fraction of this total, 1,184 million gallons (4.027 tonnes). All other vessels, including non-oil cargo vessels, fishing boats, passenger ships and freighters, spilled 14,706 million gallons (50,020 tonnes) from 147 oil spills between 1960 and 1996, while there were only 5 spills in 1996 in the other vessel category, accounting for 112,000 gallons (381 tonnes).
- The preliminary estimates for 1999 spills indicate that the volume of oil spilled worldwide (of more than 10,000 gallons per spill) may be comparable to the 32 million gallons (109,000 tonnes) spilled in 1998. However, a closer review of the actual spills shows that a number of these occurred in ecologically sensitive areas at the unfortunate or "wrong times", such as during nesting season. For example, the Maltese freighter *Erika* broke up in France in the Bay of Biscay, causing extensive damage to shorebirds because of the time of the year when the spill occurred (OSIR, 2000a).

* This sum represents " ... about one-thousandth of one percent of the 281 billion gallons of oil consumed by Americans during the year". The number of spills greater than 10,000 gallons, considered large spills, was the third lowest total per year over a 10-year period (API, 1998).

- USCG data indicate that the post-OPA 90 rate for incidents has decreased significantly to 0.5 major oil spills per year. No large spills of over 5000 barrels from tankers have occurred in the US since 1991 (Moore, 1999).
- INTERTANKO (1999a) data support the finding that spills from oil tankers have declined in US waters from 27% in the 70s, to 24% in the 80s, to 12% in the 90s.

The unanswered question is whether these trends will continue in the future, given some seemingly unchangeable realities. More oil will move to more people around the world, 75% of which will be carried by vessels. The following gives concern for the continued safe transport of oil by ship:

- Doubling of the world population from 6 billion in 1999 to 10.6 billion people in the next century, consistent with the UN projected growth factors (Brown et al., 1998).
- World fossil fuel energy consumption increasing annually with the US being the greatest energy consumer and with no sign of decreasing or alternative energy use in sight for the US and other developed countries (Olah, 1997). Oil consumption globally rose from a few thousand barrels of oil daily in 1900 to 72 million barrels a day by 1997 (Brown et al., 1998).
- Americans consume 281 billion gallons of oil annually (API, 1998). This equates to 294 million gallons of oil per day moved by tankers, or 107,310 million gallons of oil per year, 30% of the worldwide waterborne oil moved and imported to the US, with more than 4000 tanker port calls (INTERTANKO, 1999a).
- The current 67% consumption of oil for transport fuel is projected to increase to 80% in the forecasted future. By 1997, some 1600 foreign freight ships and 5800 foreign freight vessels moved through US waters, transporting petroleum products and accounting for 90% of all US port calls. Oil imports will experience continued growth, projected at 3.0% per year in the next decade (USCG, 1997).
- In 1998, the total crude oil and refined products transported by sea amounted to more than 2000 million tonnes, which in weight terms represented 40% of the total cargoes shipped by sea (Commission of the European Communities, 2000).

The fact that more oil moves to more people does not necessarily equate to more spills. Global transportation of oil has increased since the mid-1980s. Yet, the ratio of billion tonne-miles of seaborne oil trade to oil spills greater than 7 tonnes since 1974 has declined (White, personal communication, 1999). ITOPF concludes that even with an increase in seaborne oil trade, now approaching the high levels of the mid-1970s, the number of oil spills remains low (ITOPF, 1999a). Even though this analysis provides some comfort, the expected population growth and oil consumption levels and other statistical factors cited above do not allow for complacency in any sector of the oil transportation industry.

While statistics are meaningful, one oil spill like the *Exxon Valdez* spill of 1989 can bring about great annual variation in the total quantities of oil spilled. The figures



Anonymous, *AP*.

of a particular year may (therefore) be severely distorted by a single large incident (ITOPF, 1999). Captain Malcolm Williams, USCG, former Chief of the Office of Maritime and International Law, agrees with this statement.

> "The good news is that the total volume of oil spilled and the number of spills have declined. The fact the amount spilled annually has significantly declined strongly suggests that something is happening out there. Either the evasive shippers are getting weeded out or many have decided to initiate programs like the American Waterways Operators and others to be more responsible carriers. But, every now and again something happens as in the *Berman* spill in Puerto Rico. Big spills are still happening internationally. In the large spill category (>100,000 gallons) the numbers are down. But, the recent two large spills off Scotland and Wales, can greatly impact *statistics* about gallons spilled per million carried. The trends still show fewer spills and less oil in the marine environment. While a major spill could impact dramatically the statistics about gallons spilled per million gallons carried, the trend of fewer spills would not be affected. The *real* message is that the US Coast Guard and others have to continue to be vigilant, employ new technologies for prevention and response, and vigorously implement lessons learned from accidents and spills, notwithstanding the encouraging oil spill trends and statistics" (Williams, personal interview, 1998; Williams personal communication, 1999).

In the future, oil spill statistics may be heavily influenced by the following factors: (1) Increased population and corresponding worldwide consumption of oil; (2) increased vessel traffic through the same choke points; and (3) the fact that the global fleet is aging. Larger, safer and double-hulled (or equivalent alternative) vessels are a focus for the new millennium. Certainly, the unchangeable reality of these factors suggests a need for increased vigilance, continued action in preventing oil spills in the first instance, and then, when oil does spill, improved response capability through better integration of science and technologies.

1.3. Environmental Damage—The Debate

The amount of oil from natural seeps in the world's oceans and from land based sources (riverine transport and runoff) is significant in comparison to the amount spilled from ships. However, a point source of spilled oil creates potentially long-term environmental damage to natural resources and ecosystems, which is recognized as "pollution". During the development of the London Dumping Convention, many debates were held about the etymology of the term "pollution". Early debates argued that "pollution" included also the transport of sediment and contaminants during floods because of similarity of impacts from man made pollution events (discharges, spills, etc.). However, these natural catastrophic events were realized to be short-term natural events (<14 days) and not of longer-term as were man made events with more permanent environmental change or impact. This led to the development of a formal definition of pollution by GESAMP (Champ, 1983).

GESAMP, (Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection) acts as an advisory body of specialized experts to the International Maritime Organization (IMO) and other international groups. GESAMP has defined "marine pollution" as follows:

> "Pollution means the introduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities, including fishing, impairment of quality for use of seawater and reduction of amenities" (GESAMP, 1993).

Oil in appropriate concentrations is a toxic substance, which can affect marine organisms. Over the past 20 years, since the *Amoco Cadiz* 1978 oil spill, there have been numerous studies of the fate and impact of oil on marine biota. There is a strong difference of opinion among scientists conducting these studies about the ultimate impact, in terms of length and severity of disturbance on various marine organisms and ecosystems. That debate continues today and frames much of the disparity between the US and the international community in terms of:



By Jeff MacNelly, *The Daily Review*, May 22, 1989.

- Response techniques;
- Extent of restoration activities for damaged resources; and
- Compensation granted/awarded for natural resources following an oil spill incident.

In 1993, GESAMP issued a generalized statement, which contains the kernels of two prevailing theories of impact and distills the essence of the ecological debate on the effects of spilled oil. Spills in high-energy environments (open ocean, rocky shores, etc.) may not pose significant, long-term disturbance to ecosystems. Oil spills in low-energy environments (marshes, mangroves, beaches) may, on the other hand, lead to longer-term environmental impacts:

> "Marine birds and mammals are visible victims of oil spills, and concern for chronic sublethal effects caused by spills in low-energy, shallow coastal waters and shorelines is increasing. Some habitats, such as exposed rocky shorelines, recover quickly from oiling events. Other ecosystems, such as mangroves, salt marshes, seagrasses and coral reefs, and polar habitats, are particularly vulnerable and sensitive to oil spills, and may take years to recover" (GESAMP, 1993; Hayes, 1999).

In spite of disagreement as to particulars, review of numerous studies, both laboratory based and in the field, of differing spills over years yields some consistent observations about the potential of harmful effects of oil on marine biota. The harm can best be generalized for many species:

- Larvae and juveniles are particularly susceptible, and may often die on direct contact or when they ingest oil. The loss of juveniles or smaller prey leads to a reduction of food sources (Caldwell et al., 1977; Michael, 1977; Tatum, 1977; Teal, 1977; Thomas, 1977, Straughan, 1977; summary panel discussion in Wolfe, 1977);

- Adults can be affected by being coated with oil on skin, feathers and gills, and/or be asphyxiated from inhalation of oil. In addition, they can consume oil by ingestion of oil contamination in or on food chain organisms (Albers, 1992);
- Animals coated with oils can die of hypothermia (Kooyman et al., 1977);
- Marine organisms far removed from an oil spill may experience exposure from transported oil, and from sublethal ingestion of oil from coated or contaminated food sources. High exposure levels can alter immune resistance (Laughlin and Neff, 1977; Lee, 1977; Staniken, 1977; Teal, 1977);
- Marine plants and wildlife may experience changed habitat, with resulting significant disruption of feeding and reproduction (Ladner et al., 1982; Suchanek, 1993);
- Other direct impacts can range from neurological disruption to anemia (Ladner et al., 1982);
- Recruitment of certain biota may be dramatically reduced by oil, as for example, algae and intertidal grazers (limpets and snails) (Duncan and Hooten, 1996); and
- Oil may persist in the marine environment (Hays, 1999).

The impact of oil on marine ecosystems varies due to the degree of oil spilled and the length (time period) of exposure. In general, long-term acute and chronic exposure levels are both toxic and hazardous to marine organisms. There is an exception to this rule in the unique situation in coastal areas, or thermal vents where natural long-term oil seeps and methane seeps have existed for many years with resulting specialized ecosystems. These specialized benthic communities have evolved over eons to be chemosynthetic in that they are able to degrade these hydrocarbons as energy sources (MacDonald et al., 1990). These situations demonstrate the adaptability of marine organisms and the fact that acute and chronic toxicity is both dose and period of exposure related. Certain ecosystems can tolerate and possibly even benefit from low level inputs of material, which become toxic to the organism when a certain threshold level is reached (Shigenaka, personal communication, 1999).

Even with some agreement as to generalization of the impact of oil on marine ecosystems, there is a wide divergence of opinion as to length, severity, and permanence. What emerges from this difference of viewpoint is that a gap exists in our understanding of the biological effect of oil on the overall marine environment. This was first evidenced in the US National Academy of Sciences Report (Anon, 1975), which was a summary of the impact of Petroleum in the Environment (see Anon, 1978; Bourderu and Treshow, 1978; Connell and Miller, 1984; McIntyre and Whittle, 1975).

In 1989, the *Exxon Valdez* ran aground on Bligh Reef in Prince William Sound, Alaska, spilling about 37,000 metric tons of North Slope oil, which spread across 1750 km of pristine shoreline. *Exxon Valdez* is illustrative of the on-going argument. The question: has *Prince William Sound Recovered?* receives answers from scientists across the board: “yes and no”. The reason depends upon many factors, what type of



The *Amoco Cadiz* ran aground off the coast of Brittany, France, on 16 March 1978, spilling an estimated 68.7 million gallons (230,000 tonnes) of oil, of which a significant part became stranded in low energy environments: salt marshes and estuarine river mud flats and buried within sandy beaches. This spill is listed as number 6 on the list of the largest oil spills of all time. Photography courtesy of NOAA OR&R Photo Database.

marine organism is being studied, how long after the spill, and what the known pre-spill state of the environment was. The structure of these studies, their design features, the control sites taken for baseline data, the sites chosen for the studies, as well as the analytical approaches selected have impacted the emerging results.

While some argue that crude oil still remains on stream banks where tides can flush the hydrocarbons out to impact salmon embryos at low concentrations, others suggest that even such residual oil is relatively lacking in toxicity because it is so weathered (NOAA, 1999). The lack of pre-spill information makes post-spill analysis complex, as does the "high degree of variability in the Prince William Sound environment". "Things change" making it hard to separate the effects of oil from the natural fluctuations that such a dynamic environment faces in the natural course (NOAA, 1999).

An overall summary leads to both a positive and negative answer to the question about recovery. Rapid increases in *Fucus* (an intertidal algal species commonly called Rockweed), and other infaunal and epibiotic species (those living on the surface or substrate) occurred between 1989 and 1991 at oiled and washed sites, such that plant abundance basically indicated recovery in Prince William Sound, Alaska. However, Shigenaka, a marine biologist cautions that this analysis of recovery trends over time is based on a "gross measurement", abundance (Shigenaka, personal communica-



By Jim M. Borgman, *The Cincinnati Enquirer*, July 5, 1989.

tion, 1999). Although the measurement is a gross one, it is striking in its consistent occurrence in some taxa. However, this abundance may simply reflect the lack of competition or predation due to toxicity. Researchers may find indicators of impaired recovery as they analyze trends in the same groups of plants and animals using different parameters of biological health after further field collection and designing of manipulative field experiments (Shigenaka, personal communication, 1999).

For other infauna, (animals living in gravel beach sediments), such as littleneck clams, a different result occurred. Their distribution and abundance in oiled beaches is below unoiled sites, suggesting an impact on the population and subsequent non-recovery. The question remains whether this impact is due in part to alteration of the physical environment either: (1) by the presence of the oil in the sediments; or (2) by clean-up activities to wash the oil from the shoreline; or (3) by both, which may have indirectly delayed recovery of infaunal communities. These results are a mixed message: recovery and non-recovery. Then, too, the presence of oil remaining in the Sound and the extent of its continued adverse impact is open to debate, as are the questions about the decrease in the fisheries (NOAA, 1999; Shigenaka, personal communication, 1999). The scientific debate on "How clean is clean" may go on forever. In all this scientific complexity and scientific confusion, there is a further lesson of importance to the industry. In spite of the uncertainty of science, and interpretation

of short- and long-term environmental impacts, a US jury entered a 5.3 billion dollar punitive damage award against Exxon (Holloway, 1996).

Regardless of eventual outcome in the *Exxon Valdez* spill, one well-renowned scientist states the obvious: human intervention was necessary to remove the oil. The question was how much intervention in an oil spill is required to reduce short- and long-term environmental impacts. In the clean-up, the question is "How clean is clean". Scientists will always be dealing with unknowns, never having perfect data to link actions and reactions. Uncertainty in oil spills as to the damage the substance will cause to marine biota is a given. Responsible, tailored action must happen in the face of this uncertainty (Michel, personal interview, 6 April 1999). One of Jacqueline Michel's favorite sayings is that she "has never been to the same spill twice"—meaning that no two spills are alike even if in the same place.

The uncertainty in data and understanding in environmental science have led to the development of the *precautionary principle* in assessing environmental effects and making environmental decisions (Weiss, 1989). The precautionary approach developed from situations in which data and understanding are not available to scientifically manage natural resources. In this approach, natural resource managers are interested in protecting living resources to "maintain their viability", but are without the data required for the "parameterization and verification of models that predict effects of various management actions with useful statistical confidence limits". The precautionary approach may be the only viable alternative, (less than rigorous scientific methods) for protecting vital natural resources after an oil spill. Data may not exist to make scientific decisions that meet the usual high standard of scientists. This boils down to a simplistic approach: "The choice is not between giving perfect or imperfect advice to managers. It is between giving imperfect advice or none at all". The dataless management doctrine may seem like heresy to some scientists, but to others working in the field, this system leads to making the best decisions possible when not all data are available (Johannes, 1998). In the precautionary approach, the error should be on the side of the environment.

It may be that studies of large oil spills such as the *Exxon Valdez* oil spill may be so unique due to the size of the spill, the nature of the oil spilled, the environment (with all of its unknowns) where the oil was spilled and the actual response actions taken to the spill, that it is very difficult to learn (or make comparable assessments) from that response and the scientific findings generated by that spill. Costello (1991, 1993) reported that at the time of the *Exxon Valdez* oil spill, the US preparation and available technology requirements to respond to an oil spill of that size were poorly underestimated and understaffed. Subsequently, the oil companies formed the Marine Spill Response Corporation (MSRC) when they realized that the state of oil spill response in the US for a spill the size of the *Exxon Valdez* was totally inadequate.

Therefore, assessments from smaller and more manageable oil spills in areas where on going studies with long-term biological data sets and research projects may be more useful for lessons learned from a spill (Champ et al., 1987; Wolfe et al., 1987).

An example of such studies would be those conducted at the Smithsonian Tropical Research Institute in Panama where research scientists were able to compare pre- and post-spill conditions of the ecosystems affected by the 1986 *Bahia Las Minas* oil spill. Of the 60,000 to 100,000 barrels of oil spilled in Panama, only 60,000 barrels of oil and water mix were recovered, with the balance spreading out over an 85-km stretch of coastline, including a significant stretch of coral reefs. Because of the Smithsonian historical studies, there were considerable baseline data about the ecosystem research conducted over a period of 5 years after the incident revealed negative ecosystem impacts.

Oil was found intact in bottom sediments years after the spill. Researchers concluded, " . . . that toxic effects of hydrocarbons will probably persist for at least 20 years in deep mud tropical coastal habitats affected by catastrophic oil spills" (Burns, 1993). The entire ecosystem experienced loss, with interrelated species being depleted and with the predicted return of mangroves and seagrasses (by repopulation) to pre-spill levels requiring an estimated 50 years. Burns et al. (1993) and Pennissi (1994) have summarized the following impacts from the *Bahia Las Minas* oil spill:

- Most subtidal seagrass communities survived intact;
- Seagrass communities were damaged severely in the intertidal zone (area between high and low tide lines);
- Mangroves were affected down to their roots, with a loss of as much as 74% of vegetation in the fringe habitat;
- Marine creatures living in the mangrove root systems such as sponges, anemones, corals and hydroids were almost wiped out for up to 5 years when some, but not all, reappeared; and
- Serious shoreline erosion resulted as a side effect of the loss of natural barrier mangrove, seagrass and coral habitat.

The International Tanker Owner's Pollution Federation Limited (ITOPF) is an association that is a representative of the shipping industry for oil spills. ITOPF is very interested in the costs that industry pays for oil spill clean-up and for environmental damages. This would be expected due to the fact that industry as a whole, directly or indirectly through international funds is responsible for the costs for clean-up and, for "reinstatement" of the environment.

In contrast, under OPA 90, the polluter is held liable not only for the clean-up, but also for the full environmental restoration of the damaged area following a spill.

ITOPF has served as technical advisors to its tanker-owner members, associates and their Protection & Indemnity insurers in some 400 spills in about 75 countries (White, personal communication, 1999). The concerns of ITOPF's technical advisers influence opinions of the international community and the manner in which oil spill response is conducted in certain incidents.

The difference in the predominant international and US positions manifests itself in acceptance or rejection of:

- The level of physical removal and recovery of the spilled oil to a level of diminishing return (practical) from the environment (without a discussion of "How clean is clean"); and
- The use of "natural" and long-term recovery of the impacted ecosystem over time versus clean-up intervention to aid such recovery.

These differences are further delineated in the following. Generalized parameters for response in international communities begin with these underlying principles:

- Environmental impact of a spill depends upon a wide range of factors: type of oil, amount, resources affected, sensitivity of the resources, site physical features, weather, sea conditions, time of the year/season, and effectiveness of the response (ITOPF, 1986);
- Recovery potential of marine species varies greatly. Many species live in the environment of the intertidal zone and have adapted strategies to survive frequent natural devastation by producing large numbers of planktonic larvae that are ready to recolonize depleted areas. On the other hand, long-lived species or ones which produce few young are less able to withstand natural and man-made depletions (IPIECA, 1999/2000); and
- The end result is that clean-up and restoration alternatives are shaped by the event variables, the environment, nature and extent of the spill (ITOPF, 1986).

The differences in the enunciated oil spill response principles between ITOPF and for example certain US scientists are:

- Nature is highly resilient and natural recovery will often occur with minimum human intervention (Sell et al., 1995);
- Natural systems are variable, such that it is frequently hard to separate the impact of a spill from natural fluxes and determine if the spill caused the change in the environment (Dicks, unpublished manuscript, 1999);
- Again, a common theme emerges, the uncertainty of science in the face of unknown data and variables: "Whilst it is clear that oil spills can cause environmental damage and that some characteristics of a spill may appear to be relatively easy to measure or quantify (e.g. the type of oil and amount spilled), it is impossible to extrapolate to the nature and extent of damage that will be caused". (Dicks, unpublished manuscript, 1999); and
- Technology for spill clean-up is limited "Given the limits of existing cleanup techniques, the best that we can strive for is that everyone will cooperate in mounting the most effective response that technology and the circumstances of the incident will allow" (White, personal communication, 1999).

Under OPA 90, the natural resource damage assessment process is quite different from the international regime. Once there is a determination that damage has occurred and that restoration action is possible and appropriate, scientifically based models



By Tom Meyer, *The San Francisco Chronicle*, May 4, 1989.

and abstract methodology may be used to develop restoration plans to return injured resources to their pre-spill condition on an accelerated time frame. Natural recovery without human intervention is considered, but it is not always the preferred alternative. Compensatory restoration is recognized. Acquisition of equivalent resources is also provided under the regime. Technological resources include on-water recovery and onshore activity as well as bioremediation and use of dispersants (see discussion of NRDA, Section 4.3.2).

The debate about the length and severity of the impact of petroleum on marine ecosystems is influenced by another dimension, the compensation which the international or US regimes will pay for natural resource damages. This is seen from the language and requirements of OPA 90's liability system. In this system, the definition of "injury" to the natural resources is broad and includes " . . . not only direct mortality to fish and wildlife and destruction of plants, but also sublethal effects on biota, such as loss in the reproductive capacity of fish or wildlife and in the productivity of wetlands and other ecosystems" (Grigalunas et al., 1998).

The point being delineated is that damages under OPA 90 are measured in terms of the principle of making the public whole by restoring impaired resources to their

pre-spill condition. Sublethal impacts, loss of biodiversity and biomass, and lack of a functioning ecosystem become elements crucial to determining the bottom line. The questions—"what resources has the public lost and for how long" and "can the ecosystem be restored to pre-spill conditions" translate into "how much will the polluter pay" and "has the public lost a valuable natural resource", which may not be restorable or for which there may be a need for replacement with an equivalent resource.

The International Regime defines damage and restoration of natural resources in a more limited fashion. Compensation for pollution damage from a discharge of oil is constrained by the relevant international conventions (1992 Civil Liability and Fund Conventions, see discussion in Section 4.3.3) and the clause for compensation: " . . . provided that compensation for impairment of the environment other than loss of profit from such impairment shall be limited to costs of reasonable measures of reinstatement actually undertaken or to be undertaken" (IOPC Fund 1992, 1998). *Reinstatement* is viewed more as an extension of clean-up, not governed by abstract or theoretical damage models, determined by positive steps to encourage natural recovery, in which cost and benefits are closely linked, and where outcomes of intervention are supported by greater scientific certainty of outcome. For example, a restoration program such as an artificial breeding program at a nearby site may help overcome pollution losses if the technology exists and the "likelihood of a successful enhancement of the wild population is high". Experimental programs, those untried or using unproved technology would have little benefit and would be unacceptable projects (Dicks, unpublished manuscript, 1999).

This compensation point of view impacts oil spill response and clean-up. The international regime focuses on compensating proven financial loss, rather than upon environmental damages difficult or impossible to quantify. This approach is referred to as a "more direct and rational approach" of compensation founded on the principle of economic loss, resulting from restoration or reinstatement measures. Restoration programs should not be experimental nor publicity driven. There are significant limitations to the extent to which damage can be repaired by artificial means. Reinstatement of a damaged site may be "impossible and unreasonable", particularly if natural recovery is rapid. "Engineering" may be more destructive than natural recovery without human intervention (White, personal communication, 1999).

The resolution of the scientific argument and inconsistency in position as to the effect of oil on natural resources will be the focus of political and scientific debate for the new millennium. Harmonization of these philosophical attitudes toward the importance of marine ecosystems and the human ability to remedy the impact created by a spill is still far in the future. What is clear and not uncertain is that the oceans are at risk and careful, managed action needs to be taken. Scientists have concluded that: "Humans have fundamentally affected marine ecosystems worldwide. . . . No part of the ocean remains unaffected by humans. . . . Ocean ecology can no longer be understood adequately without recognizing these ecosystem-wide perturbations. . . . Meeting these challenges will require better understanding and resolution of the

causes and consequences of change on scales from hours to millennia" (Hay and Jumars, 1999).

GESAMP, in its 1998 annual session, underlines the above thinking as expressed in the following statement of the pollution problem and call for appropriate use of management and science: "Degradation of the oceans continues on a global scale, despite progress made during the last three decades in some places and on some issues. A fundamental solution to many of the sea's environmental problems lies in scientifically informed management that integrates the range of uses of the marine environment to ensure that their benefits are sustained. Such management regimes, when effectively implemented, have produced benefits for society and the environment, but they have not been widely applied. This is largely due to a lack of informed constituencies, appropriate institutional structures, and political will" (IMO, 1998).

Perhaps what the very uncertainty of science as to the fate and impact of oil on the marine environment means is that oil spill response requires a "good management regime" guided by a basic international principle, the "precautionary principle". The precautionary principle was first enunciated in 1987 at the International Conference on the North Sea and deals with the effects of our current actions on future generations. The most frequently cited definitions of the principle underline the fact that there will always be scientific uncertainty, but where actions taken may impact the environment irreparably, the activity taken should be guided by an overriding concern of preventing environmental harm.

This principle is often cited as follows: " ... in the face of threats of irreversible environmental damage, lack of full scientific certainty is no excuse to postpone actions which are justified in their own right. ... " "Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation". Preventive measures should be undertaken " ... even where there is no conclusive evidence to prove a causal link to certain effects ... " (Weiss, 1989).

The oil shipping industry is a risk business, where the possibilities of an oil spill are ever present, and where the impacts of that spill on humans and natural resources are certain, although difficult to measure. The very character of this industry argues for a systematic, scientifically based regime where all responsible players act with prudent care in the prevention and then response to oil spills. In fact, one can argue that the *precautionary principle* underlies the entirety of this heavily regulated industry and that the industry is a working example of how best to apply prudent care within an informed institutional structure. The Preambles to two major oil pollution treaties MARPOL 73/78 (the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978) and OPRC, (International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990) (see discussions in Sections 4.2.1 and 2.4 respectively) reiterate the basic elements of this international doctrine:

For example, the wording of the Marpol 73, Preamble contains such language:

- "BEING CONSCIOUS of the need to preserve the human environment in general and the marine environment in particular;
- RECOGNIZING that deliberate, negligent or accidental release of oil and other harmful substances from ships constitutes a serious source of pollution;
- DESIRING to achieve the complete elimination of intentional pollution of the marine environment by oil and other harmful substances and the minimization of accidental discharge of such substances;
- CONSIDERING that this object may best be achieved by establishing rules not limited to oil pollution having a universal purport;
- HAVE AGREED as follows".

For example, the wording of OPRC, 1990 contains such language:

- "RECOGNIZING the serious threat posed to the marine environment by oil pollution incidents involving ships, offshore units, sea ports and oil handling facilities;
- MINDFUL of the importance of precautionary measures and prevention in avoiding oil pollution in the first instance, and the need for strict application of existing international instruments dealing with maritime safety and marine pollution prevention . . . ;
- MINDFUL ALSO that, in the event of an oil pollution incident, prompt and effective action is essential in order to minimize the damage which may result from such an incident;
- TAKING ACCOUNT of the 'polluter pays' principle as a general principle of international law,
- HAVE AGREED as follows" (OPRC, 1990, Preamble).

Oil spills are a continuing reality. "Oil spills in the US are a daily occurrence" (Etkin, 1998). The same statement applies to international waters. While the debate continues about how much and for how long oil affects the marine environment, the precautionary principle and good business sense argue for prudent care of the resources at risk. The benchmark criteria for this highly regulated industry should be adoption of the safety culture in management systems to prevent spills and of sound science to respond to them.

1.4. Reoccurrence of Spills: Root Causes/Risk Factors

Analysis of the most recent oil spills of 10,000 gallons or more internationally and in the US leads to the inevitable conclusion that oil spills have a high probability of occurrence. Their impact is not insignificant just because they are a localized point source. Oil spills from tankers account for 3–5% of all oil pollution into the oceans and seas of the world. Tanker operations account for another 7% (INTERTANKO, 1997, 1999b; GESAMP, 1993).

There are many root causes for reoccurrence of spills. These can be identified generally as:

- Aging world fleet;
- Decrease in maintenance;
- Seafarers less well trained;
- Multinational and smaller crews;
- Open registers/"Flags of Convenience";
- Human error;
- Fatigue; and
- Limited trade routes/choke points.

Difficult economic conditions for the shipping industry over the past several decades have produced unintended consequences. Except for some of the large major companies, ship owners have not ordered new tonnage. The result is that the average age of the world fleet is over 15 years (INTERTANKO, 1997). Coupled with less money being put into maintenance, corrosion, mechanical breakdowns and other factors, the older ships are subject to accidents (IMO, 1995). A case in point was the oil spill of 1.3 million gallons (6200 tonnes) of medium fuel oil into the Sea of Japan on 2 January 1997, involving a Russian vessel, constructed in 1970, the *Nakhodka*. Experts engaged by the International Oil Pollution Compensation Fund concluded that a Japanese survey (JAMSTEC) of the structure revealed significant corrosion of the steel in the vessel and deficiencies in welding. The vessel broke up in 10-m seas in a storm in the Sea of Japan and oiled northern Japanese beaches. The spill occurred during the Japanese New Year and was first predicted not to come ashore since it occurred over 200 km offshore. However, the Japanese were unprepared for responding with technologies for open ocean response and clean-up and the oil came ashore oiling northern beaches. Over 8000 public volunteers were used to hand clean-up beaches and rocky shorelines (Champ et al., 1997b).

The report found that the *Nakhodka* had been improperly maintained and sent to sea in an unseaworthy condition, such that the stresses on her old hull as a result of heavy weather and rough seas caused the ship to break in two in 10-m seas in the Sea of Japan (Golob's, 1997a; IOPC Fund, 1998). The Maltese tanker, *Erika*, broke in two during a storm on 12 December 1999, off the Southern coast of France. The French government concluded that long-neglected tank corrosion caused a chain of structural failures leading to the splitting up of the 24-year-old *Erika* (OSIR, 2000b). A major, recent study states that there is a positive correlation of risk factors in ships between 10 and 14 years of age, with the beginning of a trend in the incidence of major claims (for $100,000 or more), moving into a higher incidence of claims from ships in the 15- to 19-year bracket. This study cautions that other factors come into play than just age, including size, trading patterns, length of voyage, discharging and loading operations, and of course, human error (UK P&I Club, 1998).

In its Communication of March 2000, the Commission of the European Communities stressed the impact of the aging fleet pattern by calling for a regulation accelerating the phasing-in of double hulls or equivalent design requirements for single-hull oil tankers operating in European waters. The Communication called for conformity with age limits and end-dates regulated by OPA 90 (see Section 4.3.1), which provides essentially, that by the year 2015, single-hull tankers will no longer be able to operate in US waters. According to the Communication, as of 1999, the average age of the world tanker fleet transporting oil is 18 years, with 41% (2939) of these ships being over 20 years old. This figure translates into 36% of the total tanker tonnage at sea (Commission, 2000).

Ownership patterns and practices have changed from those traditionally in place in the industry, with shipping evolving from being controlled by the major oil companies who owned 25% of world tanker tonnage and controlled 50% of long-term charters, to many independents of different Flag States controlling vessel shipping, with the majors now owning less than 9% of the total tonnage (IMO, 1995). The world Independent owners fleet numbers 2551 tankers (as of February 1999) with tanker tonnage of an average drawing weight of 226.4 million. In contrast, the total oil company/state tanker owners' fleets are comprised of 877 tankers with tanker tonnage of 73.2 million drawing weight (INTERTANKO, 1999b).

This decentralization and internationalization of shipping in itself has had far-ranging consequences:

- Seafarers are less well trained and paid with crews being supplied in many cases from developing countries;
- Smaller and multinational crews are the norm with members speaking many languages and poor communication existing between officers and crew;
- There has been a shortage of trained officers and some predict this will problem will only increase; and
- Open registers often equate to "flags of convenience" with an established practice of substandard operators shopping for and finding such flags with less stringent regulations and qualifications for certification (IMO, 1994, 1995).

While these factors based in world economics play an important role in the reoccurrence of spills, the main cause of oil spills is "human error". After numerous studies, the shipping industry has come to realize that human error accounts for 80% of all marine casualties (US Coast Guard, 1995). ITOPF studies support this conclusion. Human error contributes most significantly to accidents and caused 83% of all oil spills over 700 tonnes during the period 1974 to 1998 (ITOPF, 1999).

The US Coast Guard defines *human error* as "acts or omissions of personnel which affect successful performance". *Human factors* involve the interaction between equipment and the human operator, and most importantly, the procedures the crew and management follow (Card, 1995).

Individuals are affected by errors in judgment, stress due to poor training, inadequate staffing, poor living conditions and fatigue. Several studies conducted by the IMO's Maritime Safety Committee, the USCG, and consortiums of stakeholders like that of the Prince William Sound Risk Assessment group have broken down the root causes for human error into discrete units in an attempt to predict and correct this endemic problem. Basic human and organizational errors defined as the primary causes of human error include: diminished ability due to physical or other condition, such as fatigue, hazardous shipboard environment, lack of knowledge, skills or experience, poor management practices, and faulty perceptions or understanding of the external environment. These causes in turn create vessel operational errors, which range from poor decision making, to poor judgment, to incomplete information, to poor communications (Harrald et al., 1997).

Fatigue plays a major role in marine accidents. Factors producing fatigue include among many, work and rest periods, manning levels, ship–shore communication and support, quality of working and living environment, crew composition, and environmental factors such as weather (Pattofatto, 1997).

The UK P&I Club, one of the largest protection and indemnity insurers of tankers in the world, concluded a comprehensive inspection of 555 ships insured by the Club over a 12-month period, which resulted in a report in 1996 entitled: *The Human Factor: A Report on Manning*. The conclusions drawn in this report support the above overview of factors which lead to the reoccurrence of oil spills. As a general statement, the report summarizes the state of manning of ships as of February 1996. While change is underway in many important areas due to implementation of new treaty requirements, the comments contained in the UK P&I Club (1996) report apply today:

- "The term *human element* is now commonly used but there are several constituent factors which are each worthy of separate consideration. Fatigue, for example, undoubtedly plays a significant part in accidents. Ships are required to operate twenty four hours a day and so are ships' crews .... The quality of a ship's crew has a direct bearing on the ship's overall performance. It is not necessarily true to say that sub-standard ships always have sub-standard crews but a sub-standard crew almost certainly means a sub-standard ship .... In the 1990s, ensuring that a ship is properly as well as economically manned, is not easy ...".
- "The relative decline in the numbers of ships sailing under traditional maritime flags, together with the associated or perhaps coincidental reduction in the numbers of experienced seafarers trained in those countries, has altered career patterns with changes in responsibilities, career development, depth of training, and in the levels of experience to be found among officers and ratings".
- "The need to reduce costs is evident in a climate of depression and overtonnage. Owners have always used cheap crews and there is nothing new about the employment of mixed crews. The inspectors found that, of the ships visited,

56% had mixed crews". While mixed crews do not necessarily mean substandard operations, the fact is that mixed languages result in potential communications problems (UK P&I Club, 1996).

- The 1998 major claims analysis report of the UK P&I Club affirms the finding that human error "dominates the underlying causes of major claims" and " . . . whether of the crew, deck officers, shore personnel, pilot, account(s) for a significant percentage of recorded incidents" (UK P&I, 1998). Recent examples of oil spills demonstrate several or all of these causes at play. Poor decision making, and ship handling error caused a Liberian tanker, the *Julie N*, to hit a bridge in Portland, Maine, spilling 170,000 gallons of fuel oil on 27 September 1996, when the docking pilot ordered the ship's helmsman to turn to port instead of starboard (Golob's, 1996, 1997b). Lack of knowledge of rocks and reefs near shore, caused a Panamanian tanker *San Jorge* to run aground on an uncharted rock near Punta Del Este, Uruguay, spilling 5000 metric tons of crude oil on 8 February 1997 (Golob's, 1998).

Cost cutting, improper emergency repair, poor training, poor judgment from illegal use of drugs, and poor decision making in ordering the ship to travel at full speed ahead on an emergency repair to a towing line, produced the *Morris J. Berman* spill, off the coast of San Juan, Puerto Rico on 4 January 1994, spilling 798,000 gallons of oil at a cost to the US taxpayer of $87 million dollars (Ornitz, 1996). Pilotage was the main cause of the *Sea Empress* spill off Milford Haven, South Wales in February, 1996. The pilot failed to take effective and appropriate action to keep the single-hull vessel in the deeper part of the channel. Due in part to poor training, the pilot and harbor masters did not discuss a pilotage plan before the vessel started its approach to port (INTERTANKO, 1997).

The continuing increased market for petroleum products is another risk factor that may undermine the best efforts of the shipping community. Ships are the most effective means for meeting worldwide, consumer demand, through limited trade routes. All ships transporting oil move through six major trade routes, commonly referred to as *choke points*, because they are subject to incredible shipping congestion. The shipping lanes include: Strait of Hormuz, Strait of Malacca, Suez Canal in Egypt, Bosporus, Rotterdam Harbor and the Panama Canal in Central American (Bordeaux, 1994). The highest risk of accident happens when a vessel enters port, traveling at slow speeds in "constrained waters". With more ships moving through the very narrow shipping lanes (for example, the Panama Canal is a narrow passage of about 50 miles), the potential for collisions, groundings and other mishaps rises correspondingly.

The US contributes significantly to this world problem. In 1998, Americans consumed an average of 18.7 million barrels of oil per day for transportation, heating, power for industrial facilities, and for about 3000 everyday products that facilitate a high standard of living. At least 56% of that was imported. In total, about 10 million barrels (420 million gallons) per day of oil are delivered to the US in ships owned

and operated by members of API (the American Petroleum Institute, which represents over 400 companies) and INTERTANKO (the trade association which represents over 50% of the tanker tonnage afloat) (Moore, 1999).

These circumstances in world oil needs underline the overwhelming necessity for industry and governments to take preventive action and avoid the otherwise certain reoccurrence of oil spills. These facts support the most rigorous enforcement of the significant changes for shipping envisioned by the most recent amendments to international treaties. These same risk factors underscore the importance of the movement toward self-regulation and self-policing of the industry, including partnerships between industry and governmental agencies, and initiation within companies of numerous safety management systems implemented by responsible industry leaders. Without continual improvement and focus on safety and the human element, it is possible to project that the root causes and risk factors will, in the end, prove the demise of the improving safety record of the oil shipping business. Support for, rather than limitations placed upon, the working principles of the safety culture should be the order of the next decade.

1.5. Available Oil Spill Response Technologies: Limiting Factors

Oil spill response is a complex and challenging cross-disciplinary experience. In the operational decision-making process, spill response combines a wide range of issues and activities under emergency response conditions that include: the nature of the material spilled, which undergoes changes in physical and chemical properties (weathering) over time, local environmental conditions, sensitivity of impacted natural resources, and selection and effectiveness of response/clean-up technologies. Response encompasses, as well, emergency mobilization, marine operations and effectiveness of operations, air surveillance, remote sensing, on site and regional spill trajectory, human protection, safety assessments, oily waste minimization, handling and disposal; and education and training. Effective oil spill planning and response today requires a large amount of available data and information and the ability to rapidly process and manage this information.

Planning and decision making in oil spill response demands an understanding of oil weathering processes, the subsequent changes in an oil's characteristics, and the effect of these changes on response technologies over time. These changes have an important influence on the usefulness and effectiveness of response methods and technologies. Four major categories of response (clean-up) technologies are available:

- Chemical treatment (dispersants, emulsion breakers);
- In-situ burning;
- Mechanical recovery (booms, skimmers, oil-waster separators, adsorbents; and

- Bioremediation (including chemical).

The two dominant processes that cause changes in oil characteristics over time are evaporation and emulsification, which significantly increase the viscosity of spilled oil. Evaporation of the more volatile components and the formation of a water-in-oil emulsion during weathering occur simultaneously during and after a spill. The rate and extent to which they proceed depends on the chemical composition of the oil and prevailing environmental conditions (such as wind speed, seawater and air temperature, and sea state). The relationships between these factors and the changes in key properties during weathering have to be well understood as well as the effectiveness of specific response technologies under these conditions, in order to estimate and delineate windows-of-opportunity for specific clean-up methodologies and technologies. To reduce environmental risks and provide greater environmental protection and achieve maximum cost benefits in implementing response strategies, response tactics and technologies must incorporate better science in technology selection and use and spill response decision making (NRC, 1975, 1985, 1989; Fingas et al., 1978; ITOPF, 1986; Doerffer, 1992; Nordvik et al., 1995a, b; Champ et al., 1997a; Champ and Ornitz, 1999; Fingas and Punt, 2000).

Methods and technologies in each of these categories are limited by environmental conditions both operationally and as a result of the changes in oil characteristics over time. Effective use of dispersants, in-situ burning and some mechanical technologies is limited in time and governed by changes in oil properties. The most efficient, environmentally preferred, and cost effective spill response is dependent on the following factors:

- Chemistry of the spilled product;
- Quantity;
- Location;
- Response time;
- Environmental conditions; and
- Effectiveness of available or prepositioned response technologies.

1.6. Other Limiting Factors: Lack of Integration of Science and Engineering, Coordination in Planning and Training

There is strong motivation to incorporate good science into each stage of the business of shipping oil. The motivating factors include:

- High costs of environmental damages;
- Legal impacts of civil and criminal fines;
- Potential jail sentences for responsible parties from the highest company officials to crew;

- Public opinion and its resultant political outpourings;
- Recognition that safety is good for business; and
- Recognition that, in this era of competitive markets, zero accidents and zero casualties mean positive bottom line results for companies.

Companies who continue to be interested in their bottom line will need to heed the admonition of GESAMP, the joint group of experts advising IMO and other international organizations. The solution to marine pollution lies in great part in "sustainable management based on sound scientific information" (IMO, 1998).

This concept applies most particularly to shipping oil:

- First, good science is needed to inform and create appropriate oil spill contingency plans under the pre-planning requirements of OPA 90 (the Oil Pollution Act of 1990)—or pursuant to the respective international conventions (most specifically MARPOL 73/78, (shipboard oil pollution emergency plan requirement—International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978), (Regulation 26 of Annex I)—and the planning provisions of the OPRC Convention, (International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990, Articles III and VI and Resolution 7).
- Second, decisions based on sound scientific principles are indispensable for effective and efficient response, either in training personnel who will conduct the response or during the actual clean-up of an oil spill. OPA 90 requires area drills for ship owners/operators, both internal and external and at times without prior notice, to test spill response preparedness. All stakeholders are to participate. The results are to be published on an annual basis (33 USC 1321 (j)(7)). In response to this requirement, the US Coast Guard and other responsible US agencies have developed the National Preparedness for Response Exercise Program (PREP). PREP exercises involve a range of drills, from internal exercises by companies, to tabletop exercises, to full Area Exercises, where all players are involved with deployment of equipment in a "worst case discharge" drill. For vessels, this phrase means that the entire cargo is discharged under adverse weather conditions. PREP Guidelines were published in August 1994. (See Section 2.6 of this book for further discussion of the US National Response System.)

The response plans required by OPA 90 must describe the training given to persons on a tank vessel so that they can respond to an oil spill. The US Coast Guard Regulations which relate to the training described in the company vessel response plans are found in 33 CFR parts 150, 154 and 155 (Sahatjian, 1996; USCG, 1994a, b).

Resolution 7 of the OPRC provides for an international commitment to training and preparedness. The International Maritime Organization, (IMO) with the cooperation and assistance of industry, interested governments, and other organizations has and is continuing to develop and implement training programs for oil pollution

preparedness and response. Three levels of training have been targeted: Level 1—operational staff; Level 2—middle management or on-scene commanders; Senior management level—decision makers at the upper level. (See Section 2.4 of this book for further discussion of OPRC.)

Preparedness and training requirements have been incorporated into the national response system used in the US and into other response systems used worldwide. See Sections 2.3–2.6. Within each response regime is an underlying need for the use of appropriate technology as a basis of effective response. Decision making at each phase of an oil spill response must be:

- Scientifically based;
- Technically and environmentally correct;
- Able to integrate in real time a wide array of data & information;
- Reflective of extensive pre-planning and training at all levels; and
- Inclusive of all stakeholders in crucial stages (Ornitz, 1999).

Captain Harlan Henderson, former Commanding Officer of the US Coast Guard Marine Safety Office in San Francisco Bay, has been involved in the *Exxon Valdez*, the *Saudi Arabia* spills after the Gulf War, and the recent *M/V Kure* Oil Spill in November 1997 in Humboldt Bay, California. In speaking during an international meeting in Australia, Captain Henderson issued this telling admonishment against the blanket use of technology. He focused on the dangers of relying too strongly on technological wonders, without the use of careful science:

> "Use technology but be cautious. Significant technological progress has been made in the field of response management. Technology is an area within spill management with tremendous potential. New systems should be analyzed, carefully tested and aggressively implemented when determined to add value to the response. However, several systems have been too big and too complex to effectively use. Other systems have not been properly tested before being accepted. A great deal of time and money can be wasted without first completing up front analysis. Also, if the care and feeding of the system is too great, it will take away from the main objective of the response organization which is to minimize the impact of the spill" (Henderson, 1998).

Captain Henderson's points find international concurrence. Dr. Ian White, Managing Director of ITOPF (International Tanker Owners Pollution Federation Ltd.) echoes similar conclusions. ITOPF has experience with hundreds of oil spills. Dr. White, in his observations, identifies the strands of a successful, coordinated response: plans, well rehearsed in advance, training of a response organization before a spill occurs, and use of sound science applied to the particularized elements for each spill situation.

> "(However), an efficient and cost-effective response is only likely to be achieved if there are realistic and well-rehearsed local, area and national contingency

plans; effective organization and management of the response operations; and full attention given to the experience and technical knowledge accumulated worldwide over the past three decades so that past mistakes are not repeated" (White, personal communication, 1999).

Both these observers, from two different response regimes, point to the crucial need for a well-developed response system, based on real science, which is applied appropriately to training and then actual response. While Dr. White emphasizes that the keys to successful clean-up are good organization, management of response operations, and a large dose of "commonsense". Henderson and others underscore a current lack in today's response systems of an integration of science and technology into training, planning and response. The Technology "windows-of-opportunity", pioneered by Nordvik (1995), Nordvik et al., (1995a, b, c), Champ et al. (1997a, b, 1998) and Champ and Ornitz (1999), focuses on inserting the highest level of basic science and engineering into oil spill response decision making.

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Chapter 2

The Need and the Solution

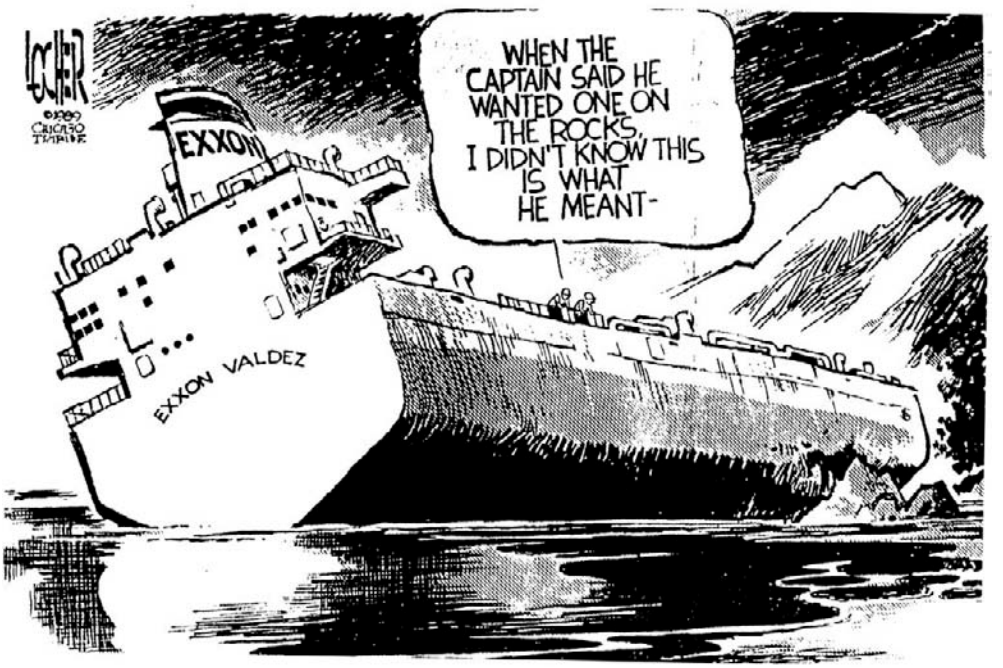
Oil spills are no longer considered an unavoidable "accident" of environmental conditions or a function of a catastrophic event. Human error accounts for 80% of all marine casualties (ITOPF, 1999; Ornitz, 1996; USCG, 1995).*

Key to the UN marine conventions related to oil spills and shipping oil

Acronym	Formal name	IMO/Official citation
ISM code	International Safety Management Code	IMO (1997)
SOLAS	International Convention for the Safety of Life at Sea	IMO (1997)
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978	STCW Code & STCW 95 Amendments (IMO, 1996)
MARPOL 73/78	International Convention for Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978	MARPOL 73 (IMO, 1997) MARPOL 78 (IMO, 1997)
OPRC	International Convention on Oil Pollution Preparedness, Response and Co-Operation, 1990	IMO (1991)
Intervention	International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969	IMO (1977)
CLC [1969]	Civil Liability for Oil Pollution Damage, 1969 and Protocols, 1976	IMO (1977)
Fund Convention [1971]	Conference on the Establishment of an International Compensation Fund for Oil Pollution Damages, 1971 and Protocol, 1984 IMO (1985)	IMO (1972)
1992 CLC and Fund Conventions	1992 Protocols to the CLC and Fund Convention	IMO (1993)
US regulations		
OPA 90	Oil Pollution Act of 1990	US Congress (1990)

* In this book, we utilize two approaches for citations: (1) is the formal first time original source citation, and (2) because laws, regulations, conventions, and treaties are Amended over time, we are listing amendments (i.e., US Code and Amendments) or we list a preferred reference Website (URL) which is continually updated from either a government agency or other reliable reference source from industry or public organization (NGO). We appreciate that Websites are not standardized or certified "official" sources, but in many cases the site has the complete document downloadable as a PDF file.

Oil Spills First Principles: Prevention and Best Response. Edited by B.E. Ornitz and M.A. Champ
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By Dick Locher, *Chicago Tribune*, 1989.

The international community, through the International Maritime Organization (IMO), has embraced the approach that the chief factor in accidents is the human element and that a change in attitude, adoption of the "safety culture" with its focus on people, is the most productive way to prevent shipping incidents. William A. O'Neil, Secretary-General of the IMO reaffirms the IMO focus on people:

> "Accidents do not just happen, they are caused—and they are caused by people making mistakes. All too often, the response to an accident has been to change the technical requirements. These changes have sometimes had little relation to the cause of the accident and therefore have done nothing to prevent it being repeated. The other reaction to an accident is to look for someone to blame. This is a problem that cannot be solved by adding more regulations. It requires a change of attitude—the adoption of a culture, which puts safety at the top of its list of priorities. For two decades now IMO has been emphasizing that more should be done to ensure that existing regulations are properly implemented. That is where people come in, because it is people who can make this happen" (IMO, 1997).

Significant changes in the regulatory structure embody the new concept of the safety culture:

- The entry into force of the International Safety Management Code, (ISM Code), Chapter IX of the Annex to the International Convention for the Safety of Life at Sea (SOLAS) which became effective in July 1998 for much of the oil carrying fleet. [For Library formal citations for conventions, see Website http:/www.imo.org/imo/library/literature/litstart.htm].
- Amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW), placement of technical requirements into a new STCW Code (STCW 95 amendments) with emphasis upon creating an international minimum standard of competency. For the first time in its history, IMO acts as the reviewer of flag administration systems to ensure that the Flag State's mariners have been trained and certified properly.
- Other amendments to SOLAS and to The International Convention for the Prevention of Pollution from Ships, 1973, with its 1978 Protocol, (MARPOL 73/78). These provide greater authority for Port State control officials to inspect ships not only for technical compliance, but also to assess the ability of the ship's crew to perform operational requirements consistent with their duties.

With the implementation of these conventions internationally and as adopted in the US, the safety culture has become a technological and political imperative for the maritime industry. These conventions are discussed in Sections 3.5, 4.2.1, 4.2.2, 4.2.3 and 4.2.4 of this book.

In the US, another substantial step along the path of prevention is the active involvement of the shipping industry as a partner with the US Coast Guard through an innovative program, Prevention Through People (PTP). This initiative focuses upon the human element in accidents. The intention of PTP is to create a more educated, qualified, result-oriented system in which people prevent the incident from occurring in the first place, and then respond in the most effective way once a spill happens.

To reduce human error, the whole of the response system, nationally and internationally, is being viewed through the lens of the people element. A major redefinition of what constitutes a "best response" is emerging. The US Coast Guard's "best response" model is one which measures success in terms of accomplishing "critical success factors" which in turn help responders reach the goal of minimizing the consequences of a spill and the impact on the environment (Kuchin and Hereth, 1999). People and early involvement of all stakeholders are the keys to producing a best response. Stakeholders serve also as the resource used to measure how well the players conducted the response, to determine if the goals set were met. Under the US national response system, several sets of contingency plans integrate the stakeholders and cover all geographic areas of jurisdiction, from the national area contingency plan to the individual ship owners' vessel response plans. People make these plans work.

The International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990 (OPRC) addresses these concerns (IMO, 1991). Under OPRC, people

are the key to effective response. OPRC helps frame regional agreements, cost sharing between countries in a region, methods for obtaining equipment and manpower, regional response plans, and training.

In spite of differences in approach to response clean-up and restoration, the world community and the US and Canada face the same technological and human-oriented challenges. Gaps exist in the planning process, in the delivery, enforcement and funding of responses, and in the incorporation of good science into all phases of response. These gaps will require the following much needed attention:

- Internationally, the response generally is conducted not by the responsible party, as in the US and Canadian systems, but by the governmental authority charged with conducting the business of the clean-up.
- The focal points of concern are communication and coordination between nations and their relevant governmental agencies in a region affected by a spill, the training and development of qualified manpower to respond and the presence or absence of sufficient equipment to conduct an effective clean-up.
- Significant gaps exist between the potential for best response of developed and developing countries. Best response in the US is still in the developmental stages.
- Involvement of stakeholders in each phase of response is a universal challenge.

The legal and regulatory philosophy of response systems globally shares a common basis, that both prevention and response be effective and efficient. Improved human performance through development of a safety management system and wholehearted adoption of the concepts behind the *safety culture* will inevitably lead to less incidents and to *best response* when and if spills do happen. The crucial, unresolved issue is a practical, not a philosophical one, "implementation".

2.1. Prevention Through People—The Human Element

The PTP Program (developed by the USCG in 1995) with its emphasis on the "safety culture" and development of public/private industry partnerships focuses upon all aspects of the human element and its impact on shipping safety and environmental pollution. The concept behind PTP is that design and technology alone will not prevent accidents at sea. People are the ones who design, build and operate the technology and must therefore be the focus of accident prevention.

> "Despite engineering and technological innovations, significant marine casualties continue to occur .... There is a clear need to critically address people issues. The issues must be addressed, not only from the traditional man and machine interface and economics aspects, but must also include an assessment of entire processes including navigating the vessel, cargo loading and unloading, and responding to emergencies" (Card, 1995).

The vision of PTP's strategic plan is to create a *safety culture*: "To achieve the world's safest, most environmentally sound and cost-effective marine operations, by emphasizing the role of people in preventing casualties and pollution" (USCG, 1996).

In developing a model system, PTP focuses on root or actual causes of accidents, the human element and the organizational, social and behavioral aspects that affect the performance of people. The emphasis shifts from the technologically oriented question of how equipment will work to a new question. "How will it work with people" (USCG, 1997a).

The PTP program developed a systems approach to deal with the entirety of a safe operating system and the influence of all participants and stakeholders. These include governmental agencies, regulatory bodies, industry management, crew, classification societies, and all others in the chain of responsibility. Analysis of these influences led to identification of five key components:

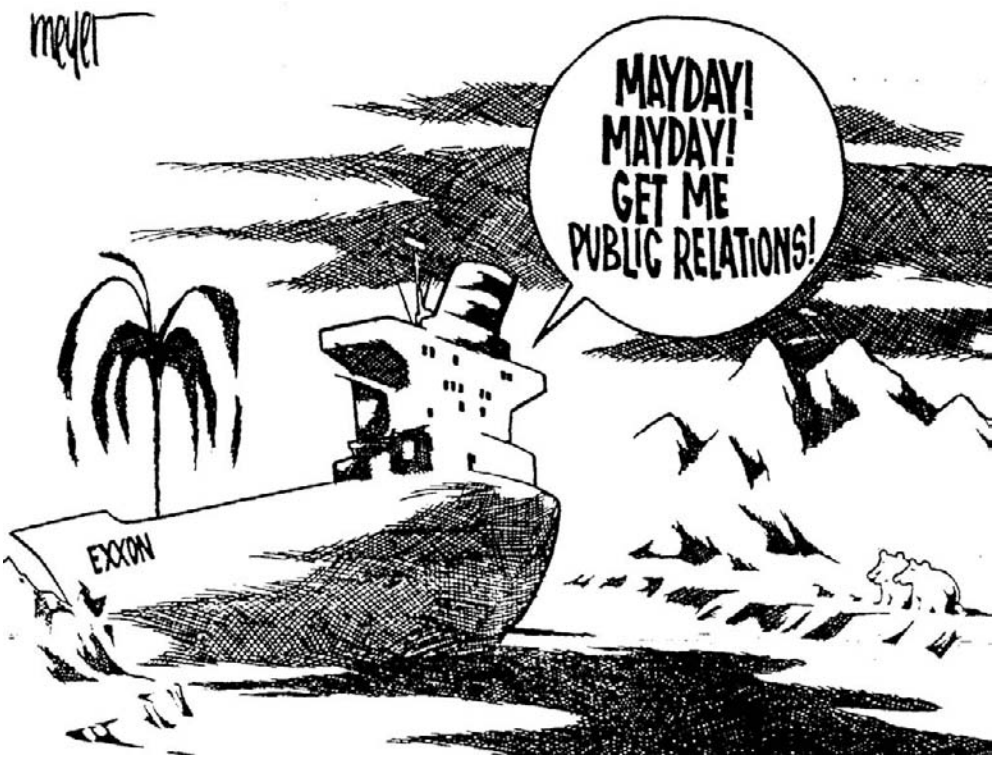
- Rules, regulations and standards affecting vessel specifications and operations;
- Management of vessels;
- Work environment which interfaces with people, machinery and the natural environment;
- Behavior of the people involved; and
- New technology and its impact on how the system functions.

These components affect each other and the marine working environment as a whole. For example, automation is an important part of the maritime system. Regulations set standards for engineers to use in designing safe systems for new applications. Proper management ensures careful installation, maintenance, and then training of crew in the use of automation. Installation focuses not only on technology, but also upon how the equipment will be maintained and used by people. People receive proper training about operating the system and taking appropriate corrective action to deal with glitches, service, maintenance, failures and repairs (USCG, 1997a). Interdependence of all people involved with their systems is pivotal.

The PTP philosophy evolved as set of guiding principles to reach the goals, objectives and activities that serve as the framework for the approach:

- Honor the mariner;
- Take a quality approach;
- Share commitment;
- Manage risk; and
- Seek non-regulatory solutions.

The last principle is the one which represents a trend toward a healthier, more sustainable industry, based upon self-regulation, "proaction", rather than depending upon outside "policemen" to foster compliance or "reaction". A major role of regulation is to set the "floor" (base limit) for safe operations. Non-regulatory solutions, when promoted by those in the business of transportation, serve as the primary means of



By Tom Meyer, *The San Francisco Chronicle*, March 28, 1989.

raising the whole system above the minimum floor. PTP creates a "buy-in" from those who are the most regulated and stand to gain the most from innovative solutions for the weak links in the safety system. Resources previously unavailable become part of the pool for managing risk. Those most concerned become dedicated to solving their own problems, placing the former regulators in a position of facilitators and educators. Change from within is the most effective way to create true cultural change. The strategy to "Seek non-regulatory solutions" opens another door to a form of co-operation between government and industry. Those engaged together in coordinated activity, refocused on the human element, can see old problems in a new light, and reach new solutions (USCG, 1997a; Close, personal interview, 1999).

The US Coast Guard developed five goals, as a frame of reference for organizing specific objectives and activities to be implemented by subsequent industry plans. These are:

- *Know more*—expand knowledge and understanding of the role of human element, think "outside the box" in approaching marine safety;

- *Train more*—give members of the marine community the necessary skills and knowledge to improve safety and prevent pollution, use all settings, not just the classroom;
- *Do more*—improve performance through practical application and open communication, learn from programs and implement them within the marine community;
- *Offer more*—provide incentives for improvement in safety management systems, include crew in solutions; and
- *Cooperate more*—work together with industry and the public to address the human element problem (USCG, 1997a, b).

In the fall of 1997, as a result of meeting with senior officers from leading industry sectors, (commonly referred to as the "PTP Champions") the US Coast Guard refined its focus. Over 30 objectives under each principle, with over 140 activities under the objectives were organized to deal with discrete tasks, which could be attained within a reasonable time. These refinements became the basis for the US Coast Guard 1998 Implementation Plan, and in part, for the 1999 plan as well. An examination of these specific activities shows the far-reaching impact of PTP in dealing with the root causes of accidents (USCG, 1996; Close, personal interview, 1999).

Know more: Develop a national maritime safety reporting system to deal with "near-miss" reporting. The concept behind this system is that for incidents that actually happen, such as collisions, groundings, and vessel fires, many others are prevented for one reason or another. By capturing information on near misses, lessons learned, and the root causes, this information can be used internally to avoid future incidents. For example, entry into the Port of Cleveland can involve navigation in severe high winds in a narrow river. When a ship entered port, a northwest gust of wind caused the bow to nearly ram a dock and nearby building. The captain reported the incident, and the US Coast Guard Captain of the Port immediately issued a high wind advisory for future use by other vessels. In its purest form, such a system can identify risky situations by vessel type, geographical location or scenario. Near miss statistics help to make accident statistics more interpretative and meaningful. While industry supports this program, there are potential problems with liability, concern about notations being entered into records of a particular vessel by the US Coast Guard and other cultural concerns, which must be addressed before this, is a functioning system.

Train more: Implement the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW 95) amendments in two specific ways: First, in terms of increasing the focus on the human element in the maritime training academies and their programs for certification of mariners, and second, in increasing awareness of Port State control inspectors about the crew's demonstration of compliance with STCW standards of proficiency in performance of actual tasks. In the US, this activity is causing a total adjustment of licensing and training requirements as further mandated by STCW 95.

Do more: Implement the International Safety Management Code, which requires certain ships and their operating companies to have a safety management system in place. For the US Coast Guard, enforcing the ISM Code requires among other actions, internal training of US Coast Guard inspectors and investigators to determine actual compliance for vessels entering US ports, to see if a quality safety management system truly exists, i.e., that "there is meat behind the paper".

Offer more: Continue to implement the Streamlined Inspection Program (SIP), allowing crew and masters of ships to be actively involved in verifying that ship systems, especially safety systems, comply with the regulations and are working properly. This encourages full compliance continuously, not just during the few days before the annual inspection conducted by the US Coast Guard. This program began in partnership with the Offshore Marine Services Association, with the crew inspecting emergency and other equipment on a more frequent basis, on an established time table to make sure that equipment was checked routinely, to report back to home office with problems disclosed during self-inspection, and to maintain appropriate records. The success of the program has led those involved to have better operating vessels and shorter down time caused by US Coast Guard inspections. The SIP Final Rule was published in the August 1998 (63 Federal Register No. 44345).

Cooperate more: Develop a PTP communications plan, a guide to act as an internal job aide within the Coast Guard to provide information and advice, specifically about human element lessons learned and communicate such information with those targeted, internal agency groups, industry, and others. The "Guide to Improving Communications", provides basic, but much needed guidance about how to identify a message, target the audience, develop the message, and then deliver it to those targeted (USCG, 1999). For example, information about wearing safety glasses might be communicated more effectively to crew members by including that information in a company newsletter or a flyer given with the paycheck. Other information might be more suited to communication within Coast Guard units by electronic mail or between companies by Internet access.

It is under this last principle, *Cooperate more*, that the US Coast Guard has formed eight significant partnerships with industry, making use of the expertise, resources and innovations that those involved can bring to solving practical problems in the field. Two of these are discussed below to serve as an example of how a coordinated focus of industry and government upon the human element will result in better prevention and response.

One of the early established partnerships (September 1995) is that which exists between the American Waterways Operators (AWO) and the US Coast Guard, and is referred to as "Quality Partnership for Marine Safety and Environmental Protection". AWO is an US national trade association, which represents the owners and operators

of tugboats, towboats and barges along the inland waterway system, and in domestic coastal commerce including non-contiguous territories/commonwealths, like Puerto Rico. The organization has been in existence since 1944, has over 375 members, covers more than 33,000 people aboard 6200 tugs and towboats and more than 30,000 barges, and moves over 600 million tons of cargo per year, or 15% of the US freight (AWO, 1997a; Allegretti, personal interview, 1999).

The objective of the partnership was to establish a program of informal, yet structured processes to address issues of marine safety and environmental protection with a more flexible mechanism for joint action in a results-oriented, non-regulatory atmosphere (USCG/AWO, 1995). The result of this undertaking has been the formation of a national quality steering committee of US Coast Guard and AWO leaders who meet twice each year. This team formed regional quality steering committees in three areas of the country. These committees meet, identify real problems, suggest actual solutions, establish a timetable for resolution, and set up Quality Action Teams to work toward solutions. The more than 18 Quality Action Teams have each produced safety recommendations and provide the national quality steering committee with a method of tracking results.

An early outcome of this partnership was a campaign, which implemented safety solutions to the problem of deckhands falling overboard and the resulting high fatalities on inland towing vessels. The S.A.F.E. Decks campaign produced some 30,000-information brochures distributed to employees of tugboats, towboats and barge companies, with a corresponding decreasing rate in such fatalities. Many other initiatives are underway. Quality Action Teams are focusing upon reducing spills from major tank barges, providing aids to navigation, dredge disposal, and a towing vessel-boarding program. Past cooperation with the US Coast Guard yielded successes in Vessel Traffic Services, licensing of mariners, tank barge transfer spills, inland towing guides and other such programs. The value of this partnership for the safety culture has been recognized (AWO, 1997b; AWO, 1998; Allegretti, personal interview, 1999).

In February 1998, another partnership was formed between the US Coast Guard and the Spill Control Association of America (SCAA), which was expanded to include the Association of Petroleum Industry Cooperative managers. The purpose of this partnership is to create an action team, which in turn will form working groups to study key issues identified by the oil spill response community and the US Coast Guard (Golob's, 1998). Starting in 1998, the action team focused upon three main areas:

- The first involves the basic Ordering Agreement Process when the US Coast Guard contracts by pre-approved documents with spill response providers for services in the event of a US Coast Guard managed spill. While the contracts are in place, there are many unresolved problems of application, which can, if not solved, affect prompt action by spill contractors.

- The second area deals with a Dispersant Memoranda of Understanding and the need for appropriate aircraft to deliver required dispersant capability. OPA 90 mandates that only private resources are used to respond to spills. When in fact, except for the Marine Spill Response Corporation and the National Response Corporation through agreements with the US Coast Guard (see further discussion in Section 2.5 of this book) there is limited access to the large aircraft capable of dispersant activity (C-130s or Hercules aircraft). These are almost completely government owned and operated, expensive, and not geographically distributed. For small spills, groups around the country can utilize crop dusters to deliver dispersant. Vessel-based delivery systems exist as well, which can deliver dispersants in situations where aircraft cannot, for example, when visibility problems exist. Future resolution of the access to larger aircraft is important given the increasing interest and potential role that dispersants may have in future clean-up activities.
- The third target involves resolving the public/private resource issue. OPA 90 requires a large buildup of private equipment for spill response, and yet, industry responders are the primary users of public resources during an oil spill. The US Coast Guard needs to develop a protocol with response companies to aid in decision making about the appropriate use of such resources during an oil spill response of significance (Golob's, 1998; Miller, personal interview, 1999).

Another partnership focusing on the human element and oil spills is that of the American Petroleum Institute (API) and the Chamber of Shipping of America (CSA). This partnership is working with the US Coast Guard on the questions of bridge communications and bridge resource management from the time a vessel enters US waters until it is docked. Of further mention is a partnership formed with the American Pilot's Association to deal with the type of information a pilot receives when he first boards a ship, the information the master makes available and other practical concerns (Close, personal interview, 1999).

PTP should result in benefit to crew, the environment and all other members of the marine industry. Targeting the human element is good business. Projections and actual returns for those investing in the safety culture include reduced marine casualties, lower accident rates, higher employee moral, more competitiveness, greater worker safety and protection of the environment. The projected cost of US marine-related accidents to the marine industry is more than 1.1 billion dollars a year in lost lives, injuries and environmental damage. Reduction of any of these costs promotes bottom line efficiencies, saves human lives and protects the environment (USCG, 1997b). Further discussion of *true cost accounting* is presented in Section 3.3 of this book.

Given the high percentage of international ships calling at US ports, and the international focus on the human element, one challenge for the millennium is the incorporation of the PTP principles by the IMO, into the convention and regulatory development process. IMO has risen to this challenge. Realizing that the international conventions are not a panacea for all human element problems, particularly with im-

plementation problems, IMO's senior technical body, the Maritime Safety Committee (MSC) has been working systematically on the question of the impact of the human element on maritime casualties. A joint Working Group of the MSC and the Marine Environment Protection Committee (MEPC) is dealing with the influence of the human element, particularly the questions of fatigue, in the complex ship setting where man and machine are closely interconnected (IMO, 1998a). The Sub-Committee on Standards of Training and Watchkeeping is to considering the fatigue issue in its ongoing review of IMO Resolution A.481 (XII), Principles of Safe Manning (IMO 1998a). The Sub-Committee on Flag State Implementation is considering whether Port State control authorities should set up procedures to determine if seafarers on ships they inspect are working excessive hours (IMO, 1998b; Pattofatto, 1997). Another joint working group, IMO and the International Labor Organization (ILO) have agreed upon guidelines for the investigation of the role of the human factor in marine casualties and accidents, which guidelines can provide advice for the investigators of the human element in all incidents (IMO, 1998a).

An international study of the human element and its role in accidents was conducted by the UK P&I Club and published, entitled: *The Human Factor: A Report on Manning* (UK P&I, 1996). This study found that the term "human element" is really composed of several factors, each of which is worth major consideration. Each signifies an "element" which can lead to human error and oil spill accidents:

- Fatigue;
- Morale;
- Motivation;
- Loyalty;
- Training;
- Standards of Certification;
- Experience;
- Conditions of service;
- Environment;
- Language; and
- Management policies.

The study concluded with a summary, which echoes the thinking of the shipping industry in this next era. Seafarers are human and make mistakes. But, good management, training, and qualified, experienced seafarers can reduce human error. The importance of focusing on the human element means the difference between standard and substandard shipping (UK P&I, 1996).

This and other studies have convinced IMO to develop a strategic plan to ensure that it addresses the human element sufficiently in its rule-development process. IMO intends to base its work in part on the US Coast Guard's PTP Program. Balancing the technical and human element aspects in the rule development process will be the focus of IMO deliberations and discussions over the next few decades (Pattofatto,



The SS *Argo Merchang (LI)* ran aground on Fishing Rip (Nantucket Shoals) southeast of Nantucket Island, in Buzzards Bay, Massachusetts, on 15 December 1976, spilling 7,200,000 gallons of No. 6 fuel oil. No oil impacted the shoreline. Photography courtesy of NOAA OR&R Photo Database.

1997; IMO, 1998a). Success in dealing with the human element requires involvement by all those in the global community who create the safety nets around vessels, to implement the safety management systems which address how humans interact with their equipment and each other in all phases of shipping operations.

2.2. Oil Spill Response—"Best Response"

While the response community expresses concern for the human and natural environments affected by oil spills, the "polluter pays" principle is the true motivator for oil spill response (Holt, 1994). This principle was first articulated by the Organization for Economic Cooperation and Development (OECD) in 1972. Later, in 1982 OECD examined its applicability to oil pollution (OECD, 1982).The polluter pays concept has been incorporated into major international treaties, up to the "limit" of the responsible party's liability under the relevant compensation regimes (Holt, 1994). Most recently, the principle was re-expressed in the Rio Declaration on Environment and Development, as Principle 16 (UN, 1992).

Van Dyke (1996) has summarized the legal principle, in a way directly relevant to oil pollution control and response:

> "If damage or injury does result from the ocean activities of one nation or its citizens, that nation should be strictly liable for the resulting loss. This 'polluter pays' principle is now widely accepted. Under this principle, any nation or entity causing a pollution-related injury to others or to a resource should accept responsibility for the loss even if the loss is not caused by negligence. This approach is the best way to internalize the costs of ocean enterprises and promote the maximum amount of care".

In oil spill response, the polluter pays principle translates into four primary concerns:

- *Who pays* (the source of funding for the response process);
- *For what* (the compensation scheme for those damaged);
- *Who responds*; and
- *With what system of response*.

These four factors provide the framework for response models used in the US and in other countries. More specifically, the following four factors distinguish the differences between the international and US systems:

- The limits of liability for compensation to be paid by the polluter;
- The scope of losses to be covered, for example, the inclusion or exclusion of natural resource damages and non-economic losses;
- The party responsible for actuating and supervising the clean-up; and
- The system to be used for the response and clean-up.

The interplay of *liability, scope, responsible party* and *system* influences the entire decision-making process of response and defines what is or is not considered to be a "best response".

2.2.1. First Factor—The Limits of Liability

In the United States, OPA 90 limits the liability for costs, which the ship owner or responsible party might pay, but these limits of liability are subject to being broken for a range of reasons. These include among others, willful misconduct, gross negligence, violation of a federal safety, construction or operating regulation, failure to report an incident, and failure to provide reasonable cooperation with responsible officials. If one of these factors occurs, a polluter may be responsible for unlimited costs (OPA 90, 33 USC, Section 2704 (c) (1) (2)).

Internationally, two conventions govern compensation for oil spills from laden tankers: the 1969 International Convention on Civil Liability for Oil Pollution Damage and the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (1969 CLC, 1971 Fund Convention). The 1992 Protocols affected significant changes to these conventions (now

called 1992 CLC and the 1992 Fund Convention) in terms of the amount of compensation available and the scope of coverage. The only way to breach the liability limits is if pollution damage results from the "personal act or omission, committed with the intent to cause such damage, or recklessly with knowledge that such damage would probably result" (Sheehan, 1995).

Proof of intentional action is more difficult than proving gross negligence or violation of an US Federal Code (USC). Liability under the 1992 Conventions is more limited and less subject to expansion than under OPA 90.

2.2.2. Second Factor—The Scope of Losses

The US and international systems differ as to compensable damages. OPA 90 requires payment not only for actual real or personal property economic losses, but also the polluter is responsible for damages to natural resources, including non-economic losses such as the public's loss of use of the resource (33 USC, Section 2702(a), (b)). After a spill occurs, the polluter becomes subject for damages necessary to restore the environment to its pre-spill condition before the spill. Such restoration costs may extend to:

- "the cost of restoring, rehabilitating, replacing, or acquiring the equivalent of, the damaged natural resources,
- the diminution in value of those natural resources pending restoration, plus
- the reasonable cost of assessing those damages" (O'Connor and Mayer, 1998).

The range of damages covered under the international compensation scheme is more limited. The 1969 CLC and 1971 Fund Conventions defined *pollution damage* as "loss or damage caused outside the ship carrying oil by contamination resulting from the escape or discharge of oil from the ship, wherever such escape or discharge may occur". Excluded from such coverage are any non-economic environmental damage and any environmental resource damage not subject to a commercially exploitable market value. The conventions cover only "quantifiable economic" loss, and exclude loss ... "made on the basis of an abstract quantification of damage calculated in accordance with theoretical models" (IOPC, 1994). The 1992 Conventions added coverage for "reinstatement" of the damaged environment. For a more complete discussion of OPA 90, 1969 CLC and 1971 Fund Conventions, and 1992 Conventions, see Sections 4.3.1, 4.3.2, 4.3.3 and 4.3.4 of this book.

2.2.3. Third Factor—The Responsible Party

The third factor influencing the quality of response involves which party is considered responsible for the clean-up. Under OPA 90, the ship owner/operator is identified as the *Responsible Party*, who is represented on-scene by the Qualified Individual, the agent on the spot whose words and actions bind the ship owner/operator. Specifically, the Qualified Individual has the authority to initiate and authorize the funding for spill

response. Each vessel owner in the business of transporting oil must have a vessel response plan. This plan designates another important player, an Oil Spill Removal Organization. Acting in concert with the Federal On-Scene Coordinator and State On-Scene Coordinator, the Responsible Party and its cadre of commercial entities assume primary management of the oil spill response (Waldron, 1997; 33 USC, Section 4202(b)). Only in the case of a "no show" or ineffective Responsible Party will the US government, either the Environmental Protection Agency or the US Coast Guard, step in and fully manage the spill (33 USC, Section 1321(c); Ornitz, 1996).

Countries other than the US and Canada tend to designate the government in which the spill occurs as the party responsible for running the clean-up. This government run system controls the response operation and then seeks reimbursement under the *polluter pays* theory from the ship owner through the Civil Liability Convention and additionally from the International Oil Pollution Compensation Funds (IOPC Funds). The emphasis in the international system is upon the government performing the work and billing the polluter afterwards (Holt, 1994). A recent study of response systems shows that in 15 countries worldwide there is an increasing partnership between government and industry where industry-led response prevails. However, the majority of other countries, about 100, view government as the primary responder (Moller and Santner, 1997).

2.2.4. Fourth Factor—The Response and Clean-up System

These crucial differences in the polluter pays philosophy set the stage for the regulatory/treaty scheme addressing *best response* in US or international waters. OPA 90 establishes a National Planning and Response System for planning and coordinating response to an oil spill at all levels of government. OPA 90 creates a series of plans: on the national, (the National Contingency Plan), regional (the Regional Contingency Plan) and local levels (the Area Contingency Plan), as described in 40 C.F.R. Part 300. The purpose of these plans is to ... "ensure *effective and immediate removal* of a discharge, and mitigation or prevention of a substantial threat of a discharge, of oil or a hazardous substance" into the navigable waters, adjoining shorelines or waters of the Exclusive Economic Zone (EEZ) of the US-Planning is maximized to include removal of a substantial threat or actual "worst case discharge" for vessels in adverse weather conditions (OPA 90; see also Section 4.3.1 of this book).

Each ship operator of a tank vessel or facility operator must have in place a vessel or facility plan for response to a worst case discharge or largest foreseeable discharge (OPA 90, Sections 4201(b) and 4202 (a); Waldron et al., 1997). Tank vessels are to "...carry oil spill response equipment that is the best technology economically feasible and compatible with safe operation of the vessel". The US Coast Guard has issued regulations flushing out the elements of these vessel response plans. These regulations are codified in 33 C.F.R. Part 155 (1998). They require:

- Identification of the qualified individual;

- Representation of the quantity involved in a "worst case" discharge, the entirety of the ship's cargo;
- Training and drills for preparation for response;
- Resources identified and contracted for;
- Adequate notification procedures in the event of a discharge;
- Response scenarios for worst case, average most probable discharge and maximum most probable discharge;
- Specific times within which resources can be mobilized;
- Certain discharge removal equipment must be on board;
- Plans must be updated and reviewed (Olney in Sullivan, 1998); and
- For tank vessels operating in the United States, on-water-oil spill recovery capacity requirements increased by 25% effective 5 April 2000 (OSIR, 2000).

2.2.5. International Regulatory Regime: Fourth Factor

Internationally, a working group of the IMO prepared similar guidelines for vessel response plans, (Resolution MEPC.54 (32) now incorporated into MARPOL 73/78 as Regulation 26 to Annex I.) These guidelines apply to all oil tankers of 150 gross tonnage and above and every other ship of 450 gross tonnage and above. These vessels must have in place a shipboard oil pollution emergency plan. Without such a plan, a vessel cannot receive an International Oil Pollution Prevention (IOPP) Certificate, necessary for the vessel to sail. As of 1995, all vessels were required to have such plans in place (IMO, 1992). Regulation 26 of MARPOL 73/78 requires plans to be in accordance with the IMO issued resolution to include at a minimum the following:

- Notification procedures in the event of a spill;
- Persons and authorities to be contacted;
- Action to be taken by those on board to reduce harm; and
- Procedures and points of contact for coordination with national and local authorities (Regulation 26, Annex I, MARPOL 73/78).

The International Convention on Oil Pollution Preparedness, Response and Cooperation of 1990 (OPRC) was created to provide a "global framework" for international preparation and response to oil spills and imposes two primary obligations on nations:

- Reporting by the countries parties to the Convention of an oil spill incident to the nearest neighbors; and
- The creation of a national system for responding to spills, with each government having a national contingency plan in place and pre-positioned oil spill equipment and response organizations ready to respond (OPRC, 1990).

These two conventions are the primary engines powering the international response system (Holt, 1995). See Section 2.4 of this book for further discussion of OPRC, and Section 4.2.1 for MARPOL 73/78.

While the US regime speaks to "effective and immediate" removal and "worst case" scenarios, the international response system is geared toward a "reasonable" response. Throughout the IOPC Funds Claims Manuals for the two compensation funds, the 1971 and 1992 Funds, the term "reasonable" is defined in similar fashion:

- *General criteria:* "any expense must relate to measures which are deemed reasonable and justified";
- *Clean-up operations:* "Claims for measures to prevent or minimize pollution damage are assessed on the basis of objective criteria. The fact that a government or other public body decides to take certain measures does not in itself mean that the measures are reasonable for the purpose of the conventions. The technical reasonableness is assessed on the basis of the facts available at the time of the decision to take the measures . . . . The costs incurred, and the relationship between these costs and the benefits derived or expected, should be reasonable";
- *Measures to prevent pure economic loss:* The "cost of the measures is not disproportionate to the further damage or loss which they are intended to mitigate. The measures are appropriate and offer a reasonable prospect of being successful"; and
- *Environmental damage:* The same requirements apply as those stated in pure economic loss claims (IOPC, 1998).

The system of response used throughout the US is the National Interagency Incident Management System (NIIMS) Incident Command System (ICS) patterned after the fire fighting system in use in America for years (see Figure 2.1).

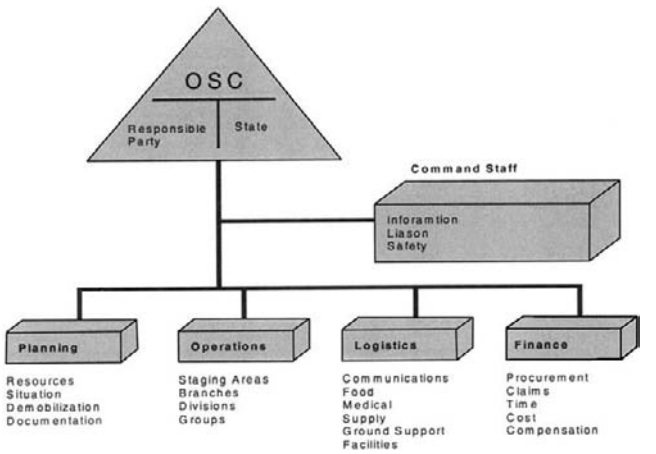


Fig. 2.1. The National Interagency Incident Management System (NIIMS) Incident Command System (ICS) and its organization (Hereth, 1998).

In most other countries, this highly organized structure is not in use, although other nations, such as Australia, are beginning to adapt the NIIMS ICS concept. See

the next section for a full discussion of NIIMS ICS. See Section 5.1 of this book for discussions on the Australian system (Henderson, 1998; personal interview, 1999).

Operations in the field of response reflect these competing principles. Best response is a concept in flux, giving way to developing a better model of the concept. The differences between the US and international community regimes continue. Best response is slowly evolving in the US and internationally. As Jacqueline Michel (of Research Planning, Inc) has often said: "No two oil spills are alike". Over the past two decades, oil spill response has been greatly influenced by trial and error. Responders have learned from experience. Oil spill Research and Development (R&D) is expensive and significantly under funded. At one time the estimated global annual R&D budgets were in the range of $100 million, with specific major R&D groups organized, such as NOFO, AEA, CEDRA, SINTF, USCG, MMS, MSRC and others. These groups focused worldwide on oil spill response technologies. A problem emerged in that Government funded R&D was more generally applied, while industry R&D was more restricted to specific interests. Neither type of R&D was focused on basic research on processes. The outcome of this lack of funding for basic research is easily seen by the limited number of formal university R&D programs in oil spill response and published papers (Engelhardt, 1994).

The funding of governments and industry for oil spill response R&D has declined in the last decade. In the mid-90s, a major example was when the US oil industry cancelled the R&D Program at the MSRC. Among several reasons were these: the fact that the number of big spills had declined, they could not see a proprietary user for their funding, and new high technology advances (dispersant aircraft, etc) had the potential of being far more expensive than less informed current response approaches. Unfortunately, this decline in interest and funding occurred at a time when the science and engineering knowledge base for oil spill response decision-making was coming together for from work that had been initiated or recommended since the 1980s.

In addition:

- The oil response industry is very conservative and is very comfortable in working with what it knows and what worked in the past; and
- Industry learns from experience (what did not work), and not from theory or models (Champ et al., 1997).

Responders over the past two decades have tried what worked during a former spill on the current spill, only to find that the old techniques did not work because of differences in oil types, state of emulsification, environmental conditions, etc (Nordvik et al., 1995a, b, c). This trial and error method has led the global research community to continue its search for basic science and engineering principles that could be used to predict the response of the oil under different physical and environmental conditions. The focus has been on the transport, fate and effects of oils spilled in the marine environment (Fingas et al., 1979; Daling et al., 1990; Daling and Hokstad, 1991; Aamo et al., 1993, and references cited therein) and identifying properties of oil to be matched

with different response or treatment technologies. This work originally began in the North Sea with European R&D groups focusing on modeling and treatment systems and with the early research focused on dispersant technologies. This R&D led to the early work of Nordvik (1995a, b, 2000); Nordvik et al. (1995a, b, c, 1996); Champ et al. (1997a, b, 1998); Champ and Ornitz (1999) and references cited therein). This later work continued to focus on the chemical and physical properties of oil under different environmental conditions and the integration of these data and information to identify technology preferred time periods to select what technologies to use for the *best response*.

While combining science with response and harmonization of approach between the international and US regimes may be an accomplished fact in the distant future, commonality of focus has emerged. There is consensus among the world community as to these common areas for improvement: All stakeholders must be involved in the response. Sound science and technology should be incorporated into all levels of planning and response. Success of the response should be judged on different criteria than that applied in the past, on the concept of "endpoints" and restoration. Regional cooperation is needed in terms of manpower and equipment.

2.3. Best Response—The US Model for Oil Spill Response

Defining what is a *best response* is a work in progress in the US In developing its response strategy, the US Coast Guard has adapted military doctrine for its response system, known as the National Interagency Incident Management System—Incident Command System (NIIMS ICS), (USCG, 1997). ICS is a model based on military theory from the World War I-era Prussian staff system, refined by National Park Service firefighters to extinguish large forest fires. ICS is the method currently used by the US to respond to large oil spills. The model divides work into manageable, yet related units:

- *Command* is the authority that sets objectives;
- *Operations* stages and implements the plan, directing the how for the response, for example, surface, air, shoreline;
- *Planning* gathers and analyzes information to evaluate and prepares a plan;
- *Logistics* provides food, equipment, people and support services; and
- *Finance* pays the cost.

The second tier to this model is the Unified Command Structure. The Unified Command Structure identifies the parties involved, typically federal, state, local agencies, and the spiller or Responsible Party and details how they work together. What the overall model does is coordinate the units under the Unified Command Structure. The model is tailored to the specifics of the incident (Ornitz, 1996).

NIIMS ICS provides an effective structure to standardized management of crisis response operations and non-crisis events. A key element of NIIMS ICS is a proactive training and qualification program which defines general responsibilities and duties of those involved, provides position descriptions, and gives responders the necessary tools for managing spill response (Benggio et al., 1997). The system identifies the level of an incident from a self-contained simple spill to that of a spill of national significance. The size and depth of the organization is tailored to the particular incident. The model is flexible and can be adapted to existing corporate organizational structures of Responsible Parties. Incident Management Teams are available to assist the Federal On-Scene Coordinator, helping in the overall management of the spill. These teams are composed of highly trained and experienced US Coast Guard personnel. Other personnel are provided to support particular functions, helping local personnel develop and execute strategy and objectives (USCG, 1997; Kuchin and Hereth, 1999).

The attribute of this organized form of response is that ICS provides consistency at all levels: "... terminology is consistent region to region, publications are standard nationally and certification is reliable". Furthermore, the five functional units of responsibility used to implement the system "transcend boundaries" and can be adapted to any organization, to respond to any spill, in any part of US waters (Henderson, 1998). To aid those in the field of response, is a small red book, titled the Field Operations Guide (FOG), first developed in California, and now a standard tool. FOG describes every position from "soup to nuts" involved at each level of operations and serves to fit each person into the overall hierarchy (USCG, 1996). FOG gives the responder general procedural instructions, specific position descriptions, and checklists to guide him/her in fulfilling that responder's duties.

The USCG is in the process of improving the original National Response System, established in the late 1960s in order to focus upon and define what is a successful response. The initial National Response System "... was created in answer to a number of large-scale pollution incidents that highlighted the nation's need to provide a mechanism to foster support, cooperation and collaboration among all response entities, both industry and government (federal, state, local) in order to provide best possible response".

While the goal of the old system and the new is the same, to "Minimize the Consequences of Pollution Incidents", the revision of the best response model incorporates new and emerging concepts about oil spill response. These include widening the stakeholder participation to involve more diverse interests, protection of the environment as an increasingly important target, and focus on cooperation in response through the use of public/private partnerships. With the quasimilitary system of response well established, inquiry now shifts to answering the question: *how to measure the success of a response*.

The business of the system is "best response", aimed at achieving the goal of "minimizing the consequences of pollution incidents", by protecting national interests.

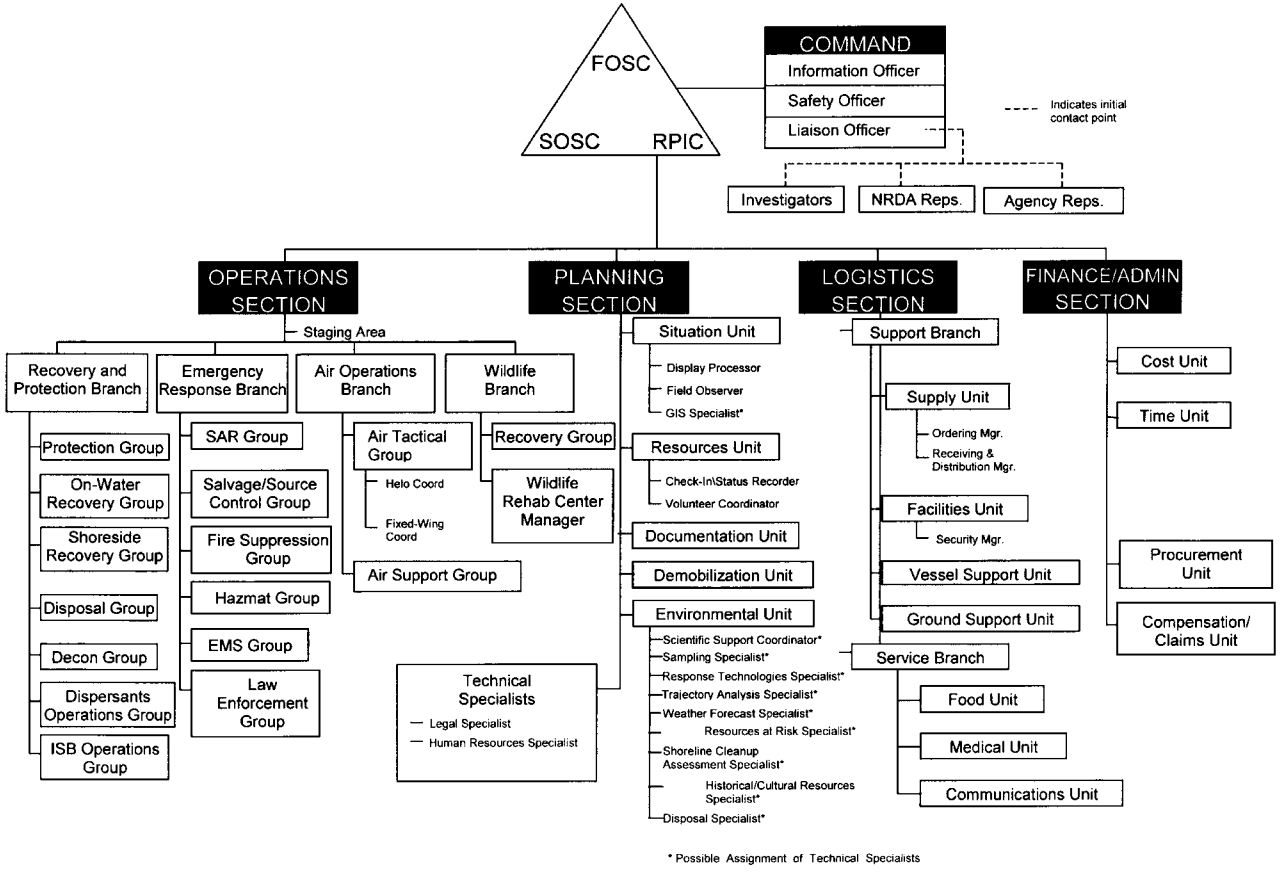


Fig. 2.2. An example of Field Operations Guide Overview of Spill Response organization (from USCG, 2000) [see http://www.uscg.mil/hq/gm/nmc/response/#Guides].

Environment ranks equally with "people, property and the economy" as a primary, national interest to be safeguarded. Industry and government are the key players, the foundation of the system. Industry includes companies responsible for building, handling and hauling oil and contractors who carry out response and clean-up (Kuchin and Hereth, 1999).

The USCG generated model of best response (Coastal Maritime Oil Spill) designates the major functions, which need to be performed, often in parallel fashion, to achieve best response. Achieving best response is not easy. Highly experienced in oil spill response, Capt. Larry Hereth, former Chief of the Office of Response of the US Coast Guard (now MSO San Francisco, CA) and Capt. Joseph T. Kuchin, Chief of the Maritime Safety Division in the US Coast Guard's Atlantic Area, describe the venture in this way:

> "Response to a major pollution emergency is like starting up, overnight, a multi-million dollar corporation with three (or more) partners (Unified Command) that don't particularly want to be in business together" (Kuchin and Hereth, 1999). Or, as Capt. Robert Ross, the Federal On-Scene Coordinator for the *Morris J. Berman* spill off the coast of San Juan, Puerto Rico, so aptly stated about that response, which was one of the most costly in US waters: "If you take the number of people involved, the rate we spent money, and annualized that over the time of the cleanup, I'd have to say that in a short 36 hours we built a Fortune 500 corporation from scratch" (Ross, personal interview, 1995).

Measuring the success of such undertakings is not any easier than fighting the spill. Yet, industry agrees that what is needed are common criteria to judge not only preparedness, but also performance. One analyst suggests that there are good reasons for such an analysis, and that such post-spill measurement is not just. Response Decision Making or consultant advice after the clean-up identifies always what should have been done when "Response organizations should be concerned with assessing performance so that improvements can be acknowledged, weaknesses identified, and the ability of the response organizations to meet goals increased", according to June Lindstedt-Siva (OSIR, 1999).

The new model developed by the US Coast Guard proposes to accomplish this task. In order to measure success in response, the model identifies six "Key Business Drivers" or consequences the system is chartered to obtain. Then, the model establishes a series of "Critical Success Factors" (CSF) used to determine if the goals were reached in protecting each area of national interest. These include:

- Human health and safety: Injury, illness and death to responders and the general public are minimized. CSF—No spill related public injuries or death;
- Natural environment: Damage to the natural environment is minimized. CSF—Sensitive areas protected;

- Economic Impact: Damage to property and the economy is minimized. CSF—Spill effectively contained/controlled;
- Public Communication: The public and the media perceive the response as successful. CSF—Positive media coverage of response;
- Stakeholder Service and Support: All stakeholders perceive the response as positive. CSF—Positive meetings with stakeholders; and
- Response Organization: The response organization effectively and efficiently responded to the incident. CSF—Clarity in leadership and responsibility at all levels.

Early involvement of all stakeholders is one of the targets. Six groups are identified:

- Environmental;
- Economic;
- Political;
- Claims;
- Natural Resource Damage Assessment trustees (NRDA); and
- Investigation

Of importance to the expanding concept of the model is the emphasis placed upon informing the public and the timely involvement in the process of investigators, not only the resource trustees, but now also the entire array of criminal investigators. The directive to response leadership is to "seek out the stakeholders, keep them informed, and actively receive(s) input from them. This ensures that, where possible, the management of the crisis will take into account their interests" (Kuchin and Hereth, 1999). See Appendix III of this book for diagrams of this model.

Having established this working model, the USCG is concentrating presently on developing a measurement/evaluation tool, a survey to determine if the goals defined by the critical success factors are met. The survey is designed to elicit comments from those most closely involved with the process to judge how well the response performed in each of the key areas. Underlying the validity of the entire system is "consensus" (Kuchin and Hereth, 1999). Consensus building relates both to the "criteria to develop performance goals and expectations" as well as to the process to be used and the stakeholders to be included (Lindstedt-Siva, 1999). Consensus may not be realized in the near future, as there does not seem to be agreement as to what should be measured and even as to which primary stakeholders should be included in the evaluation of success (OSIR, 1999).

Even given lack of consensus, the best response model and survey are positive steps toward a better, more responsible concept of preparation and response. The model:

- Sets performance expectations—defining what a successful response is;
- Acts as an alignment tool, a "shared mental model" between all players before a response;

- Is a "guide" during the spill clean-up; and
- Forms a self-evaluation tool after the response to capture best practices and lessons learned for future use (Kuchin and Hereth, 1999).

Alignment of the area contingency plans to include this new model, to account for key aspects of best response with a reorganization of format and content of the plans is underway. The goal set by the US Coast Guard is to streamline the standard plan, making the plan more action oriented, reorganizing it to fit the Incident Command System, defining what each section does, and tailoring the details to the particular needs of each geographic area (Weber, personal interview, 1998).

There is agreement by stakeholders concerned that use of the ICS system in the US is an effective way to deal with "controlled chaos". However, at least one perspective, an insurance point of view, identifies how the new model is missing the mark, shows how complex the response process is and suggests that the concept of stakeholder involvement must be expanded even further. A responsible party may have multiple insurance and insurers with various financial interests to protect and with varying degrees of funding responsibility during a spill. For example, there may be a hull insurer, a cargo/container insurer, a Protection & Indemnity Insurer and others. The Federal On-Scene Coordinator views the responsible party as a single entity, when, in fact, that individual or organization may be represented by more than one, unrelated financial interest, such as a body of insurers.

By not including each of these numerous underwriters, the responsible party may be asked to act in the absence of needed funding authorization. "The failure to integrate the insurer stakeholders into the ICS decision-making process can often result in significant delays in the ability of the RP to make response decisions, thus preventing the best possible global resolution of an event". Garger and Hobbie (1999) have suggested that the answer to this problem is training of US Coast Guard top response personnel to keep "open lines of communications with all insurance stakeholders".

Others critique the new model from a different point of view. In the international arena, specifically advisors to the International Tanker Owners Pollution Federation, Ltd., criticize the reliance of the model for its assessment of success upon public opinion, seeing the survey tool as a measurement of "perceptions, not technical efficacy". This comment underscores the concern of the international community that any spill response be based on the concept of "reasonableness" and not run by public opinion. Similarly, the need to control costs firmly leads to a question about who funds a post-spill analysis as proposed by the US Coast Guard balanced scorecard. The International Oil Pollution Compensation Funds do not agree that funding should come from their monies, according to the Director, Mans Jacobsson (OSIR, 1999). Capt. Hereth disagrees strongly with this criticism, citing the fact that the survey instrument does not rely upon public opinion in any way for its analysis of the success of the response (Hereth, personal communication, 1999).

Consensus about key issues in the new best response model may not be a reality today. But this model demonstrates that oil spill response is evolving from dependence solely upon technology to a focus upon the interrelationship between people, response tools, and systems. The human element concern of the multifunctional operations of a response is the increased recognition of the important tie between science/technology and policy, law, and people. The continuous process of performance assessment, which forms the base of the best response system, should improve spill response as performance assessment is refined into a more finished product. Improved spill response is the end goal.

2.4. Best Response—The International Oil Spill Response Model—OPRC Convention

The International Convention on Oil Pollution Preparedness, Response, and Co-Operation, 1990 (OPRC) was adopted in November, 1990 for the purpose of establishing precautionary measures and effective preparation for combating oil pollution incidents, worldwide, involving ships, offshore units, sea ports and oil handling facilities. OPRC with its Annexes and 10 resolutions entered into force 13 May 1995 for signatory countries, which was approximately 40% of world tonnage (IMO, 1999).

OPRC creates a framework for international cooperation and mutual assistance. In the event of a spill, the contracting parties agree to report the spill event to their nearest neighbors, to have in place mutual agreements for exchange of personnel and equipment between countries, and to concur in a plan whereby costs incurred by the requesting country will later be reimbursed by that party. The second major thrust of OPRC is to impose an obligation upon signatories to create a national system for responding to spills, requiring each country to have a contingency plan in place, along with pre-positioned stockpiles of equipment, (within its capabilities) and response organizations with plans for communication and coordination (IMO, 1999; Ornitz, 1996).

Major articles of OPRC cover these areas:

- Shipboard Oil Pollution Emergency Plans for every oil tanker of 150 gross tonnage and above and every other ship over 400 gross tons (Article 3.1 OPRC). (Note, that Regulation 26 of MARPOL 73/78 incorporates these provisions, procedures to be followed to notify parties of a spill, authorities and persons to be contacted, immediate practical measures to be undertaken by the crew to minimize pollution damage, procedures for coordination of shipboard action with national and local authorities) (MARPOL 73/78, Reg. 26, 1997) (Art. 3.1 OPRC);
- Contingency planning and coordinated response procedures (Art. 6.2, a and d);
- Within a country's capabilities, establishment of equipment stocks sufficient to deal with oil pollution risk (Art. 6.2, a);
- Research and development programs (Art. 8); and

- Training and exercise programs to facilitate response (Art. 6.2, b.) (Moller and Santner, 1997; IMO, 1991).

With the exception of only 7 countries, the US, Japan, Canada and US territories, almost all other countries conduct oil spill response through established governmental organizations and limit the role of the Responsible Party to reimbursing the government for spill response costs (Walker, 1994). This scheme contrasts with the US scenario of "best response" in which the Responsible Party assumes control within the Incident Command System, subject to government monitoring.

In order to facilitate a government run response to an oil spill, the OPRC encourages government/industry collaboration. This is particularly necessary because, as a practical matter, OPRC focuses upon spill preparedness and response more in developing countries than in the developed countries. For years, even preceding OPRC, developed countries have possessed not only the resources of equipment, manpower and funding, but also they have entered into several bilateral regional agreements to effectuate cooperative response. Prior to OPRC, 13 regional multinational agreements on oil pollution response cooperation exist in the world, with numerous supplemental bilateral and trilateral agreements (Holt, 1994).

The principle accords in Europe are the Bonn Agreement, signed in 1969 and expanded to include all countries bordering the North Sea and the European Union, the Helsinki Convention of 1974 and the Barcelona Convention of 1976.

- The Bonn Agreement contains a commitment to mutual cooperation in the event of a major oil spill. In addition to the Bonn Agreement, a number of bilateral agreements have been developed to cover Particular Sea Areas. The "Manche-plan" establishes how Belgium, the UK and France will exercise responsibility in the English Channel. The "Norbrit Plan" between the UK and Norway and the "Denker Plan" between Denmark and Germany establish cooperative activities between these countries. In addition, "the Copenhagen Agreement", signed by Denmark, Finland, Norway and Sweden has established a cooperation between these North countries. A "Manual on Joint Operations" has been developed.
- The Convention on the Protection of the Marine Environment of the Baltic Sea (Helsinki Convention) commits contracting parties to maintain their ability to combat oil spillage and cooperate in salvage and recovery in the Baltic Sea.
- The Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona Convention) contains similar coordinating measures for spill response for the Mediterranean Sea. Resolution 7 of the Barcelona Convention established a Regional Marine Pollution Center in Malta (Holt, 1995; Perry, 1999; Ostergaard, personal communication, 1999).

While these agreements exist, reviewers, in a report to the 1997 International Oil Spill Conference, question their effectiveness. Moller and Santner (1997) found that great disparity exists between countries in their implementation, investment in equipment

and other elements of preparedness, in the expertise needed to make the mutual cooperation aspects workable, and in their willingness to act as a "brothers' keeper". John Ostergaard, Senior Adviser of Marine Pollution of the IMO, disagrees with this finding as to the Bonn Agreement, Helsinki Convention and the various bi- and multilateral agreements. He believes this negative statement is not justified, given the results of mutual exercises and real spill operations, which IMO sees as having been effective and highly operational (Ostergaard, personal communication, 1999).

During the period of 1991 through 1994, the International Maritime Organization, (IMO) and others (the International Petroleum Industry Environmental Conservation Association, (IPIECA), the United Nations Environment Program and industry leaders) established a series of workshops designed to help countries in seven oil-sensitive regions develop plans and establish mutual cooperation pacts. These seminars reached approximately 1,000 participants in 80 countries and resulted in numerous regional government/industry cooperation agreements (IMO/IPIECA, 1995).

These regional seminars highlighted the need for follow-up activity to assist developing countries establish national response systems and the associated training programs needed to implement OPRC. The program which evolved is called the Global Initiative and was endorsed by IMO's Marine Environment Protection Committee in 1995; and MEPC, 1995. The Global Initiative produced a coordinated IMO/industry strategy aimed initially at the African Region, with the intent of accomplishing several primary objectives in the 33 African countries which participated in the initial Global Initiative planning meeting:

- Implementation of a National Response System;
- Completion of a National Oil Spill Contingency Plan; and
- Ratification of appropriate international conventions (OPRC, 1992 Civil Liability and Fund Conventions, MARPOL 73/78).

Funding for the Global Initiative missions was provided by various donor countries and IPIECA on behalf of industry. IMO's Marine Environment Division assumes the coordinating role. Teams of experts deliver the objectives through individuals from governmental agencies, the International Tanker Owners Pollution Federation Ltd., and industry representatives. Technical Missions and training courses have been completed since 1996 for Angola, Namibia, Mozambique, Tanzania, Ghana, and other African countries. These first Global Initiative activities have served as a template for future work in other parts of the world (Depraz, 1999).

IMO's Marine Environment Division is tasked with the coordinating role for the Global Initiative. IMO is of the opinion that the initiative is "doing well". Industry's involvement has been excellent in terms of training and technical assistance. Some of the African countries have national oil spill contingency plans in place, and others are in the process of developing national plans and adopting the national legislation necessary to ratify relevant conventions relative to oil spill preparedness and response. These countries are beginning to obtain the equipment needed to respond to an oil

spill. The Global Initiative is advancing into other areas of the world. Estonia, Latvia, and Lithuania should have full national Response systems and equipment in place within the next 2–3 years. On 7 April 2000, six Maritime Authorities entered into a Memorandum of Understanding on Port State control for the Black Sea with a secretariat located in Istanbul (IMO, 2000).

While John Ostergaard of the IMO regards OPRC as a success story, implementation in many countries is still in the initial phases. The problem is not so much developing a plan and then getting national legislation in place to adopt OPRC and that plan. Rather, the significant hurdle is in purchasing equipment and putting manpower in place. Quite simply, it is difficult to convince developing countries to invest money in oil spill response equipment when what is needed is bread on the table and clothes and medicine for its citizens. The companies that either own, produce, refine, or transport oil have the most to gain by involvement in OPRC with Member States. They are not only the source, but also the solution to pollution through utilization of their equipment, people, and funding (Ostergaard, Personal Interviews, 1999).

Sophie Depraz, Technical Adviser with IPIECA and the individual charged with primary responsibility for the working group behind the Global Initiative, affirms Ostergaard's view of the industry challenge:

> "National contingency planning is a full-time occupation that requires empowered individuals with energy, commitment, and skills to carry the process forward. IMO and IPIECA are committed to the process, but they are really the catalysts to the process and their role is only to initiate activities. It is extremely important that the Authorities themselves (the governments), together with the local industry, form a driving force which will further the process once the international assistance has been provided" (Depraz et al., 1999).

Industry has responded to this need. There are three internationally recognized Response Centers in the world, which were established in response to OPRC, Article 6.2 requiring the oil industry to cooperate with governments in oil spill response planning, equipment, and training. These were formed as ventures between various companies and/or regional initiatives in which companies have been involved. They are:

- Clean Caribbean Cooperative of Florida (Ft. Lauderdale) with area responsibility for the Caribbean and South America;
- Oil Spill Response Ltd (Southampton, UK) with global coverage and the largest equipment stockpile (excluding the US) capacity; and
- East Asia Response Ltd (Singapore) with an area of operations in the Indian Ocean and the western part of the Pacific Ocean.

Each of these cooperatives has the ability to respond to various size spills, as classified by IPIECA's system of Tiered Response. Tier 1 is a small, local spill. Tier 2 consists of a medium size spill in a vicinity, such as a 500 tonne bunker spill following a

grounding in a relatively remote location. Tier 3 spills are those large spills in remote locations, which cannot be handled by Tier 2 resources.

> "In 1997 and 1998, the three Centers entered into a Memorandum of Understanding providing for common objectives, chief amongst these being: exchange of technical information to facilitate support, cooperation in training, development of opportunities for staff training, cooperation on membership issues. While these Centers are working well, they too are confronted with competing financial objectives. National governments expect increased capabilities, while members of the cooperatives are seeking reductions in fees. Maintaining stockpiles of standby equipment and expensive transportation costs for deploying equipment complicate the financial picture further" (Irvine et al., 1999).

In other parts of the globe, industry has formed regional associations to develop contingency plans and respond effectively to oil spills. Two examples follow. One such organization is called ARPEL, the Regional Association of Oil and Natural Gas Companies in Latin America and the Caribbean, which has created an integrated approach to management and response to spills on a regional basis. The approach deals with the basic issues of mutual cooperation between all stakeholders, petroleum companies, the government, and the communities impacted. Formerly, ARPEL consisted primarily of government run oil companies, but privatization has occurred in all nations involved, except Mexico and Venezuela. ARPEL recognized the need for standardization. The national oil companies did not operate using common standards. Multiple documents existed on all aspects of petro energy and how it affected the environment. In response, ARPEL, with the help of Wotherspoon Environmental Inc (Wotherspoon et al., 1999) and other private Canadian organizations, conducted a series of workshops and developed a guideline to cover these areas:

- Spill contingency planning; Sensitivity mapping;
- Risk assessment; and
- Sharing of equipment, manpower and technology.

The guideline will serve as a template for government and industry to use in flushing out a cost-efficient regional approach to planning. Open questions remain about implementation. To what extent will countries adopt the guidelines and incorporate them into national regulation and/or their own guidelines? How will systems training and methodology be developed for delivery? For example, in the use of dispersants, without localized expertise, pre-approval plans and the development of a dependable supply system, delivery may not be easily accomplished. There is a potential limitation on the acceptability of the guidelines because "outsiders" developed them. At present, the realization of this concern appears negligible. Even with these unanswered questions, the proactive approach of ARPEL is in keeping with the goals of OPRC and can serve as a useful model of industry/government cooperation for other regions (Wotherspoon et al., 1999; Wotherspoon, personal interview, 1999).

In the Mahakam delta (Indonesian part of Borneo Island), an oil and gas French company has integrated its Tier 1 response capability and oil contingency plan into the state-owned oil company's regional contingency plan. "TOTAL Indonesie" is one of the production sharing contractors in the Indonesian state-owned oil company called PERTAMINA. TOTAL Indonesie has created Tier 1 spill response capability to respond to offshore, coastal or onshore spills from wells, pipelines, processing units and rigs in a sensitive natural environment, where aquaculture forms a major part of the country's income and food source. The equipment, people power, planning skills, research and technical expertise of TOTAL and its network of local operators supplements the country's own response resources. Tiers 2 and 3 back-up resources are available locally, through the state-owned company, and through use of the international resources of TOTAL's parent company. These interrelated assets can be used pursuant to mutual plans to assure effective protection of an environment, which supports the economy and provides the food source for the local inhabitants (Grandprat et al., 1999).

Progress has been made in global spill preparedness and response under the umbrella of OPRC (Moller and Santner, 1997). However, according to a survey of international and regional agreements, much work remains to be completed in the areas of inter-regional coordination, use of good science in response, and contingency planning:

> "While some aspects of international conventions and agreements have been implemented, not all provisions of these agreements are yet in place. Further initiatives to implement them have not yet spread throughout the world . . . Contingency planning has not been conducted in a comprehensive way in many countries. More work must be done in those countries to develop comprehensive contingency plans that include risk analysis, forecasts of oil movement and fate, identification and prioritisation of resources at risk, and commensurate selection of response techniques. This is an essential pre-requisite for equipment purchase" (Perry, 1999).

Furthermore, while OPRC's intent is to aid developing countries, fewer than half of the 30 countries, which have adopted the Convention, are developing countries. Another study shows that there is difficulty in funding preparedness or charging its cost to the actual polluter, leaving worldwide preparedness through the OPRC vehicle in a less than actualized state (Moller and Santner, 1997; Wonham, 1997).

2.4.1. Technical Realities

Logistical realities shape international response. Planning is hampered on a worldwide basis by the very nature of spills. "Major marine oil spills are exceptionally rare events and so it is impossible to predict where the next one will occur. This makes planning to deal with them effectively very difficult" (White, 1999). White,

the managing director for ITOPF, points to the most common logistical problems, which make responding to oil spills so difficult:

- Technical aspects, such as the type of oil impact effectiveness. Heavy crude and fuel oils are highly persistent and travel great distances, necessitating clean-up operations covering wide areas of coastline at great cost. The *Nakhodka* spill in Japan was an example.
- Location is a key factor. "Remote areas with limited access and poor infrastructure will pose particular problems. In such situations, therefore, a full evaluation of the situation needs to be made before cleanup resources located at distance from the spill site are mobilized". Local capability assessment includes among other considerations, equipment availability, airports for transportation, customs problems, personnel available, local spill response operators and capacity.
- Ultimately, the quality of the contingency plan and the organization for control of the clean-up shape the spill response. The multinational or multiregional nature of international spills weighs in to complicate response on this level: "Numerous difficult decisions as well as compromises will be required throughout the response operation, and the widely differing requirements of a multitude of governmental and private organizations, as well as public and political pressures will need to be reconciled" (White, 1999).

Because many governments do not utilize a highly structured command system, like for example, the NIIMS ICS system of the US, clean-up operations are impacted. The lack of a clear chain of command, acting as a single unit, with clear leadership hampered the salvage operation of the *Sea Empress*, when it ran aground at Milford Haven's West Channel on 15 February 1996. According to the report of the UK Department of Transportation's Marine Accident Investigation Branch, the salvage operation was "botched" due to a series of flaws in the plan and its operation:

- Lack of clear command/control organization ashore for those dealing with salvage;
- Too large an onshore management team without a clear leader;
- Salvors reacting to developments rather than anticipating them;
- Lack of a unified command of all involved, including Milford Haven Port Authority;
- Lack of sufficiently powerful tugs and knowledge of tidal currents; and
- Need to review procedures under the National Contingency Plan for salvage and deployment of tugs (Golob's, 1997).

In much the same manner as is occurring within the US system, so too is the international "best response" model a developing one. The common themes for future international "best response" are regional cooperation in the development of the manpower and equipment necessary to respond, better contingency planning, a more formalized, structured command, and continued private/public partnerships.

2.5. Efficient and Effective Response—Gaps in Delivery, Enforcement, Funding and Perception

Effective and efficient oil spill response requires the same readiness and operational functioning as fighting an actual war. "An oil spill is the closest you'll come to running a war minus the shooting" (Miller, personal interview, 1999). Those responding to an oil spill must:

- Be prepared in advance;
- Be well-organized;
- Have the right resources, the people and the equipment to respond;
- Have the ability to quickly change strategy and tactics as spill conditions shift;
- Be capable of delivering the right quantities at the correct place in sufficient time;
- Have the capacity to support and sustain a large contingent of people and equipment in the field for protracted periods of time; and
- Be trained in the proper use of their technology, or tools in the toolbox (Miller, personal interview, 1999).

A recent study of worldwide preparedness and oil spill response capability compared response readiness today with the status of response 20 years ago when the *Amoco Cadiz* spill of 1978 happened and 10+ years ago when the *Exxon Valdez* spill of 1989 occurred. The study raised three primary questions about improvements in response, with mixed answers:

- Have response capabilities for cleaning up large spills improved over the last 10–20 years, i.e., have improvements in preparedness and response capabilities been worthwhile?
- Have increased response capabilities resulted in improved performance, i.e., have the policy and infrastructure changes made a real improvement in the response community's ability to reduce the adverse impacts of a spill?
- Has improved performance had a positive effect on political, media, environmental and public perceptions? (Perry, 1999).

Perry contends that the answers to these questions must all be "yes" to support a finding of effective and efficient response. The reality is more ambiguous:

> "The answers to the three critical issues are yes—in some ways and in some places. In most areas, investment has not been just an expensive public relations exercise, but there are worrisome signs that some responders are beginning to think that it is. There have been major improvements in many parts of the world, and many countries are now much better prepared than they were 20 years ago. It is still unfortunately the case that in many places, there has been little or no improvement, either because of lack of resources, understanding of the

requirements, or will. In the last two cases, many of the myths remain, and the realities are not yet understood" (Perry, 1999).

Those working in the field of response planning and preparedness, domestically in the US and internationally, express some of the same concerns. They see the improvements in readiness and ability to respond as being significantly (night and day) different from the pre-*Exxon Valdez* era. Yet, these industry leaders warn of problems in the system of planning and response, which must be resolved or which may lead to dire consequences for the ability to achieve the US Coast Guard model of best response or the cooperative action envisioned by the International Convention on Oil Pollution Preparedness, and Response and Cooperation, 1990 (OPRC).

The following list summarizes basic concerns about effective and efficient response:

- Readiness (of those who deliver response capability);
- Enforcement (by regulators of compliance and non-compliance with preparedness and delivery requirements);
- Proper functioning (of those designated to manage a response for the responsible party or polluter);
- Interference with funding (for contractors performing the myriad of roles in response);
- Public perception (dictating response rather than actual needs);
- Technological/operational challenges (for the appropriate use of response tools, such as dispersants and in-situ burning, with coordination between command and operations);
- Perceived gap (between reality and paper compliance in contingency and vessel response plans), (see Section 2.6 of this book for further discussion); and
- The appropriate application of science in the use of response tools. (See Section 2.7 of this book for further discussion.)

Spokespersons in the industry review the factors listed above as they play out in the field. Captain Harlan Henderson, former Commanding Officer of the US Coast Guard Marine Safety Office in San Francisco Bay, California area is a 24-year veteran of oil spill response in the US His experience qualifies him to express opinions about the improvements and problems facing responders today. He is one of the creators of the Field Operations Guide used by all US Coast Guard field offices, Chief of the National Response Center, former CO of the Pacific Strike Team, leader of the US team delegated to assist in the Saudi Arabia clean-up of the largest spill in the world, and assigned to the US Coast Guard Federal On-Scene Coordinator during the Exxon Valdez spill. Capt. Henderson sees a bigger picture.

Adoption of the Incident Command System (ICS) is one of the biggest improvements to spill response. "The best tool in an emergency is a familiar face". ICS brings all players together at the Unified Command level, where they can set objectives

for each of the operational periods and can oversee in a coordinated fashion the logistics necessary to implement the plan. Capt. Henderson believes the US has made significant improvements in the last 10 years:

- The US has better plans;
- Federal, state, industry personnel work together better under one command;
- Equipment capability has increased 10-fold;
- Planning exercises prepare responders for response;
- US tank vessel control into and out of ports has improved with upgraded Vessel Traffic Systems; and
- Local training courses for those conducting and performing response exist throughout the country.

Even in a difficult area such as public relations, there is marked success. Working with the media in a concerted, direct way has yielded positive results during major spills in the coastal area of California during the last years. Captain Henderson emphasizes rapid notification, bringing journalists and reporters to the scene, showing them the equipment and personnel being used to respond, taking them onto the ships, such as the skimmers, lightering vessels, and aboard helicopter overflights, and keeping the public advised constantly of progress and problems.

The picture of response is not entirely positive. Captain Henderson warns against becoming complacent. Oil will spill and responders need to maintain a high state of readiness. With the price of oil being down, downsizing and consolidation is occurring industry-wide. Budgets and program levels need to keep pace with the pulse of preparedness. He questions the certification process in place for one of the chief providers of response, the Oil Spill Removal Organization (OSRO) designated by the responsible party. Better enforcement is necessary. The US Coast Guard must ensure that the OSROs have the equipment and activity capability that they state they have. Lessons learned from spills need to be shared among all players. His hope is that the US Coast Guard new "best response" survey may accomplish this goal, so that real improvements or solutions to problems gained in spills do not simply disappear into a "black hole". The US should consider better equipment control, releasing standby equipment not being used sooner rather than later, and adopting the international approach of using dispersants and in situ burning as response tools. In order to use these tools effectively, education of the public is required to combat an overwhelmingly negative view of dispersants. The public sees dispersants as yet another chemical being added to an already disastrous environmental situation, causing more harm than good. In the public view, in-situ burning is seen simply as exchanging oil in the water for smoke in the air.

Captain Henderson regards the gradual adoption of the Incident Command System as being of chief importance to the international community, where governments often battle oil spills without involving all responsible players. Australia, New Zealand and

certain of the Asian countries appear to be considering adoption of an ICS-like system, realizing the benefit to involving all stakeholders in the response, both in terms of preparedness and during an actual spill. In order for ICS to become part of the international response system, the international community may need to broaden its view of which resources should be protected. As in the case of the Saudi Arabian clean-up of over 11 million barrels of crude oil spilled into the Arabian Gulf in January 1991, the push was to conserve and protect valuable human resources, such as the desalinization plants. Less emphasis was placed upon care of environmental resources, such as clean shores and beaches.

There is another difference in response outlooks between the US and other countries. Where the world community might insist first on performing an assessment of the damage before equipment is brought to bear, the US response, in general, is to act first, believing it better to "over react" in the crucial first 24 hours of a spill, than not to have sufficient equipment available. Finally, he concludes that, in any part of the world, partnership is the key between industry, federal, state, local, environmental and scientific communities (Henderson, personal interview, 1999).

There are two Tier 3 Responders in the US which act on behalf of the Qualified Individual, the agent for the Responsible Party in large-scale responses. A Tier 3 response internationally is a major oil spill which requires the National Contingency Plan to be involved and national resources to be used, or in the US under OPA 90 a "Worst Case Discharge". One such entity is a for profit organization, the primary one being National Response Corporation of Calverton, New York (NRC). The other is Marine Spill Response Corporation (MSRC) a non-profit organization funded by the Marine Preservation Association. This trade association is supported by 102 members (including 16 major oil companies). These two, supplemented by a network of local subcontractors who supply equipment and person power, form the backbone of large-scale response capability in the US (Perry, 1999). The Qualified Individual is a person designated by the ship owner/operator or by the organization chosen by the ship owner/operator to implement the response plan, contract for resources, and act as liaison with the Federal On-Scene Coordinator, as provided under US Coast Guard regulations. International ship owners or operators must use a Qualified Individual located in the US (33 C.F.R. Part 155, 1998).

Mark Miller, former President of National Response Corporation, is forthright in both his praise for the accomplishments of US response and preparedness, as well as in voicing his concerns about a possible, future rapid decline in the industry. He believes the US is better prepared, with more equipment, and better organization to respond to spills today, what he terms a "day and night" difference from the days of *Exxon Valdez*. MSRC and his company are ready to respond to a worst case discharge, having committed to a massive investment of capital. Equipment is available on a standby basis and the necessary infrastructure is in place. In the past years, retainer fees from customers have maintained this state of readiness.

However, Miller observes some disturbing trends in the response business:

- *Uneven playing field*. A lack of consistent enforcement amongst responsible parties has created a "competitive disadvantage" where "hold-out" companies risk non-compliance with regulations, do not pay fees to Qualified Individuals or Oil Spill Removal Organizations, like NRC, and then do not suffer the consequences of enforcement by regulatory agencies. This in turn leads to an erosion in the market place for retainer paying customers and an uneven playing field between those companies who spend the money and comply and those substandard operators who roll the dice, chance not having a spill, and are not prepared to respond.
- *Inadequate enforcement of plans*. Nor does Miller believe that regulatory authorities are reviewing contingency plans carefully enough to determine if a listed contractor has sufficient equipment available, and the right tools to accomplish the job of response. Paper compliance, without operational capability, is becoming the game. Mathematically, a company may have capacity sufficient to skim the required barrels per day in compliance with OPA 90, but, a review of the actual equipment would show that compliance is illusory. For example, a vacuum truck can pump a large quantity of oil and sufficient numbers of such trucks might meet OPA 90 required capacity. This is in fact paper compliance because of geography. If a spill happens away from dockside, vacuum trucks don't float and the company would be unable deliver on water response.
- *Failure of OSRO qualifications*. In a similar vein, the OSRO classifications are not working. A company may receive the highest level of classification from the US Coast Guard and not have true operating capacity, sufficient organization, nor have made the capital commitment necessary to meet a responsible party's needs. Better review is required to look behind documentary compliance and see if the Oil Spill Removal Organization can truly deliver.
- *Spill Management Team animosity*. Miller sees the activities of other key players as impacting negatively upon NRC and the ability of other responders to get the job done. A Spill Management Team, the entity employed by the Responsible Party and in the case of an international incident, the Protection and Indemnity Club's agent (P&I), supervises the OSRO and that responder's subcontractors. Unlike others in the chain of response, there are no regulatory criteria for a spill management team, no classification nor credentials requirements, nor does such an entity place its capital investment at risk as does NRC or MSRC. Yet, these individuals call the shots during clean-up. Because they represent the ship owners or their insurers, the P&I Clubs, often they are perceived as being in an adversarial relationship to the OSRO, as cutting costs with or without reason. Miller supports the concept of Spill Management teams. However, such hired third party teams who target OSROs in order to justify to the responsible party or its insurer the need for the team can be non-productive and even increase the cost of a spill. This animosity between players creates a lack of cooperation at a time when maximum coordination is needed. Increasingly, Miller observes, the P&I Clubs are becoming emboldened not to pay the total claim submitted by the contractor.

While conceding that Spill Management Teams play a vital role in response, Miller is concerned that the adversarial relationship is destructive to the whole process.

- *National Pollution Fund Center discounting of OSRO claim*. One other funding organization for response in the US, the National Pollution Funds Center, has been paying Oil Spill Removal Organization claims by applying a price schedule far lower than the price schedule presented to the responsible party. The Center has been using rates given to the US Coast Guard, under a basic ordering agreement, when the OSRO was working directly for the private party under a private rate structure and not for the governmental agency.

These problems in the system cause Miller to conclude that the US is facing a downward trend on the bell curve of compliance, where those willing to roll the dice, and not play by the rules increase in number, whittling away at an otherwise strong response infrastructure. Conversely, Miller observes that an increasing number of US Companies are taking their capacity into the international field, thus raising the standard of response in other areas of the world (Miller, personal interview, 1999).

Tim Dickensheets is a member of SMQI Services, Inc's Spill Management Team and Qualified Individual services. SMQI is a full service organization with comprehensive technical and operational experience in providing global spill response management to a worldwide client base of ship owners and operators, facilities, barges and offshore production units. Dickensheets has been in the service industry for 27 years, and is experienced with field operations and with management's point of view. His emphasis has been on environmental clean-up, contingency plan preparation, project engineering and supervision, and contractor/vendor management and control. Now, Dickensheets acts as business manager for the ship owner/operator side through SMQI. He approaches response from a different perspective.

The Qualified Individual often acts as the Incident Commander, running the spill with the others involved in the Unified Command system, the Federal and State On-Scene Coordinators. In this capacity, the Qualified Individual creates the orders which the Spill Management Team (SMT) and its OSRO and subcontractors follow. The Spill Management Team then deals with plans, equipment, mobilization and personnel. Under OPA 90, the Qualified Individual must have full authority to implement removal activities. While there are training courses to aid Qualified Individuals, most gain their competence through experience. Dickensheets feels that in a spill, a Spill Management Team is necessary to handle each operational area of ICS: operations, planning, logistics and finance. The team wears many hats, providing a person/entity to whom contractors in the field can report and "keep(ing) the contractors honest" by checking the costs against benefit to the responsible party. For example, a contractor told to bring a piece of equipment will keep that equipment at the site and charge for the cost, until told to take the machinery away. The job of the SMT is to determine what is needed, when, and for how long.

While Dickensheets holds firmly to the belief that Spill Managers try to be reasonable in terms of response contractor's costs, he is aware of an increasing problem in which the P&I Club (ship owner's insurer) does not understand the need for certain equipment or expenditures, and declines to pay the entirety of a claim submitted, even when the Qualified Individual or SMT approved the expense. This refusal to pay often stems from the differing perception between the international community and the US about what clean-up is reasonably necessary and what actions should be taken to protect natural resources. What is needed is a balance between an actively involved P&I Club pressuring the SMT and questioning every bill submitted, and the contractor insisting upon being paid entirely for every service provided. Tim Dickensheets sees as a solution continual education of the P&I Club representative as to the need for and reasonableness of costs, complemented by a proportionate payment over time of the funds: first, a partial payment immediately followed by another payment within a fixed second period, with a final payment left for a reasonable future time so that any dispute can be settled between the parties (Dickensheets, personal interview, 1999). This proposal would be difficult, according to Miller, as the last payment usually contains the contractor's profit (Miller, personal interview, 1999).

SMQI represents clients in the US and internationally. Cost is an important consideration worldwide. Cutting costs overall in spill response requires cooperation of all players:

- Contractors to agree to differential rate schedules and to be more professionally responsible for their own actions. Professional responsibility means that the contractor coordinates with all members of the response, including the Spill Management Team. Just as that team has an obligation to determine what equipment and personnel are necessary and for how long, so too should the contractor assess what equipment is on site during each phase of the clean-up. The contractor should advise the Qualified Individual or SMT that, for example, 17 people are standing by on a barge and not being used. This coordination can eliminate much unnecessary cost and create a more efficient response.
- Harmonizing all terminology so there are standards terms to identify assets worldwide,
- Working with P&I Clubs to obtain prompt payment of a substantial portion of the bill submitted,
- Coordinating with state and federal officials to understand the whole concept of cost and to create trust and confidence that the decision of a Qualified Individual is motivated by health and environmental safety considerations and not "penny-pinching". However, the Qualified Individual must maintain cost-consciousness throughout an incident.

Another crucial obstacle to obtaining best response is learning to use new technology, such as dispersants or in-situ burning in a more scientifically based way and moving away from strong dependence domestically upon mechanical recovery. Finally,

Dickensheets sees public relations as an issue to be addressed in order for any spill response to be perceived as successful. The public needs to be better educated about what to expect during a response. For example, dismissing equipment or sending a contractor off a site might be appropriate when that entity can no longer serve a useful function. In all, Dickensheets views the current state of oil spill response and preparedness as a "work in progress" (Dickensheets, personal interview, 1999).

These two points of view show the nature of the debate between the contractors and the spill management teams/qualified individuals and the insurers. At a time when all those involved in response should be coordinating their efforts and functioning at their optimum as a team, such dissension and resulting distrust may negatively impact the success of the response effort.

Robert Aldag, President of the Marine Preservation Association, (MPA) voices another perspective about spill response. The Marine Preservation Association is a non-profit association composed of 102 members, including 16 oil companies who pay 98% of the funding for Marine Spill Response Corporation (MSRC) with the remaining 2% paid by independent ship owners. On the positive side, MSRC has both funding and response capacity well in excess of minimum regulatory requirements, with its own equipment available on permanent standby status and supplemented by equipment owned by its network of contractors. The response resources are stationed in regions throughout the US Dedicated equipment, available across the country provides optimal flexibility for immediate response.

However, there is a corresponding negative side to standby capacity. That is the cost. Funding of standby resources is shared by MPA members. A previous high budget of $94 million was pared down to $39 million by eliminating Research and Development, response management services, and reducing administrative presence of MSRC from five operating regions to three because the members could not continue to fund such high standby costs. MPA members independently fund other entities, such as local cooperatives, which meet local needs and whose resources may be used to respond along with those of MSRC. While Aldag believes that MSRC can meet and maintain its core response capabilities in its present state, the future of indefinite funding of standby costs by all response companies, including the cooperatives, remains an open question. The oil industry will continue to look for ways to improve how it funds response preparedness.

Complicating this picture in the US is the fact that there has not been a major oil spill since *Exxon Valdez*. While this response is an excellent outcome of the improvements in preparedness and prevention, there is a downside to "peace time". Aldag equates a spill response organization to an army or fire department. The community needs such an entity, but is increasingly less willing to pay for what it needs. The question is how does one maintain peak readiness during peacetime?

Aldag voices concerns that the for-profit response organization faces increasing difficulties in maintaining readiness in a competitive industry without retainer funding and without dedicated equipment. Bob Aldag questions the true capacity of OSROs to



The IXTOC I exploratory oil well blew out on 3 June 1979 in the Bay of Campeche off Ciudad del Carmen, Mexico in the Gulf of Mexico. This well is estimated to have spilled over 352,400 barrels (140 million gallons) of oil making it the number 2 on the list of the worlds largest oil spills behind the 1991 Gulf War Spill.

meet their response requirements. Like a voluntary fire department, whose equipment is available, at least on paper, when such resources are not dedicated to one use, they might be unavailable when the call comes for a vessel to respond at a particular place in an abbreviated time. The OSROs might be unable to deliver. Because the first 24 hours of an oil spill are the most important, access and availability are a must.

Aldag shares the concern that the playing field is not level, that regulatory enforcement of plans and of OSRO capacity must be improved, from being paper compliance to becoming actual capacity for a worst case discharge. Non-dedicated resources cited in the plan may satisfy minimum regulatory requirements. But, unlike calculations derived from use of a truer mechanism, the "mechanical equipment calculator" developed by the National Ocean and Atmospheric Administration, the regulatory minimum calculations do not always yield an accurate picture of the contractors' true capacity. This leaves MSRC in the position of being a safety net to back up other insufficiently dedicated response equipment and personnel. The safety net is tantamount to a "free ride" for non-MPA members (Aldag, personal interview, 1999).

These gaps in delivery, enforcement, funding and perception exist in the current system of response. Solutions are available for each of the suggested problems. The

dialectic between what is best response in the US and the international communities comes into play in the real world of response. Where P&I Clubs operate from one perception of "reasonableness" and protection of natural resources, and US Contractors and Qualified Individuals operate from another, the "gap" in perception can lead to inefficiencies on the ground when response is played out. Implementation of the solutions, which exist to these identified problems, poses the challenge for the new era.

2.6. Effective and Efficient Response—Gaps in Planning and Scientific Challenges

There are two other significant areas affecting preparedness and best response, which are the subject of current review and concern in the US and other countries:

- The perceived gap between reality and paper compliance in contingency and vessel response plans; and
- Lack of appropriate application of science to response.

The Oil Pollution Act of 1990 (OPA 90) and the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) require owners or operators of tank vessels carrying oil in bulk as cargo to have a Vessel Response Plan (oil pollution emergency plan) for responding to an oil spill. The US Coast Guard implemented its regulations in 1993, requiring the owners/operators of over 7500 tank vessels to submit oil spill response plans that contained new planning provisions and standards for, among other important elements, identifying the players to be activated in the event of in incident, the qualified individual and alternate (Codified in 33 C.F.R. Part 155, 1998).

A survey performed by the US Coast Guard and comments of plan holders or their qualified individuals disclose a mixed response in the US and internationally as to two basic questions about such plans:

- Do the plans prepare the plan holder to respond?
- Do they enhance an efficient, effective spill response?

In other words, do the plans just meet the requirement of providing a plan, which is really a worthless "paper tiger", not adequately reviewed, evaluated nor tested?

The US Coast Guard created two survey instruments, one submitted to plan holders for US and non-US tankers, and for inland and coastal barges. The other was sent to those who had been involved in an actual incident for both non-US and US tank ships and tank barges. What the surveys revealed is that Vessel Response Plans (VRPs) are useful in preparing a plan holder to respond because of their focus upon certain preferred planning elements. This is because such plans require and aid the plan holder to do pre-spill planning and to develop a rapid response system. However, as an actual

spill response tool, those surveyed find VRPs as being of limited use, except in their "... ability to set things in motion quickly through pre-spill preparation of the plan holder". Survey responders see the plans more as performance-oriented documents than as operational tools.

This study suggests that in the future governments or regulatory agencies should concentrate their review of the plans upon the planning elements organizations have determined to be most applicable. These include notification procedures, identification of the qualified individual, spill management teams, and selected Oil Spill Removal Organizations (OSRO), and shipboard mitigation procedures. Any VRP should cover these areas in depth (Caplis, 1999).

ExxonMobil Oil Corporation has established a strong policy of emergency response preparedness, as carried out through its shipping subsidiaries, SeaRiver Maritime based in Houston, Texas and International Marine Transport based in Leatherhead, England. Each vessel in the large fleets owned by or chartered by ExxonMobil carries its own Vessel Response Plan and Shipboard Oil Pollution Emergency Plan, as required by OPA 90, MARPOL 73/78 and relevant Flag State administrations. These plans are the guides for response action, which ExxonMobil implements in the event of a major spill through regional Response Teams located worldwide (MSTC, 1998). Overall, the company has two other formal plans, their emergency response plan, which establishes the strategy, organization, and response process for managing emergencies, and the plan establishing and instructing the Regional Response teams.

Martin Rowland, Manager, Human Resources (Fleet Personnel) for International Marine Transportation Ltd., stresses that the importance of these plans is to ensure that all necessary actions are taken by the company if an incident occurs. To guarantee that the plans can be activated effectively, ExxonMobil exercises their plans, annually, throughout the world, where local organizations respond to Tiers 1, 2 or 3 incidents in drills, with many of the members of the regional response teams being involved in the exercise (Rowland, personal interview, 1998). ExxonMobil's system exemplifies how good companies can take regulatory requirements, such as VRPs and make them into tools for efficient response.

In regions worldwide, planning for response, whether it is through regional, national contingency or local plans or vessel response plans, is often not on a level commensurate with such a major company. "Contingency planning has not been conducted in a comprehensive way in many countries and regions. More work needs to be done to develop contingency plans that include risk analysis, forecasts of oil movement, identification and prioritization of resources at risk, and commensurate selection of response techniques" (Perry, 1999). Nor are the plans updated and exercised. "It also is recognized that plans must be constantly tested and updated through regular exercise. There are still far too many places in the world, however, where satisfactory planning has not been conducted, and in some cases, inappropriate equipment purchases have been made" (Perry, 1999). Planning for information management must

be sufficiently detailed. The sufficiency or lack of detail is usually where the response battle is won or lost (Benggio, personal communication, 1999).

The second area needing more focus and attention is the integration of good science into all levels of spill response. In the US, the National Oceanic and Atmospheric Administration (NOAA) through its Scientific Support Coordinators, its Region IV group in the South East of the country, is producing a new tool to aid On-Scene Coordinators. The Oil Spill Response Technologies Guide should help those in command make better decisions about what products or response technologies may be appropriate to consider for use during various incident specific scenarios and in various environments. In general terms, what the guide will do is help to determine the appropriate niche for chemical or other clean-up techniques, based upon a pre-approved evaluation procedure, initial classing of the product or technique to be used, such as a dispersant, with a comparison from a cost/benefit viewpoint of the effectiveness of any response agent. Protocols for testing and monitoring the product will be established.

The guide sets the standards of initial evaluation, selection and implementation criteria for any agent recommended by the Regional Response Team. Vendor information is supplied for each product. Each agent is classed in terms of the environment or situation in which it might be useful. Limits to an agent's application and type of oil upon which its impact works are identified. There is a comparison of toxicity, mechanism of action, cost and availability between products. NOAA believes that standardization of such a guide throughout the US will improve substantially the decision-making process of the Federal and State On-Scene Coordinators. Development of this guide is a multiagency venture with funding from the Environmental Protection Agency's Regions 3 and 4, and NOAA guidance provided by the US Coast Guard.

The incident of a grounding of a freighter, the *M/V Fortuna Reefer*, in July 1997 off a particularly sensitive marine reserve in Puerto Rico, is an example of the current gaps in the response system for planning and implementing dispersant use in the US While there are pre-approval agreements throughout the Caribbean, the grounding location was near shore and on living coral, so that it was an area excluded from dispersant use pre-approval. Further complicating the response was that there was no pre-planned capability for prompt delivery in terms of equipment or product. The nearest dispersant source was several thousand miles away from the site of the potential bunker discharge (Benggio, personal interview, 1998).

Incorporation of the approach of the "Technology Windows-of-Opportunity" into pre-approvals and coordinated planning of a technology reference guide, would help even further to steer those in command not only by specifying the types of products for clean-up, but also by providing the time frames during which such products would be effective (Champ and Nordvik, 1999).

From a technological standpoint, one of the key associations funding response in the US, the Marine Preservation Association, (MPA) has supported activities to

broaden dispersant use and in-situ burning application, with progress in obtaining pre-approvals for dispersant application and in-situ in many regional response team areas of the US Aldag, the President of MPA, argues for the responsible use of more tools such as these in the response arsenal. The international community is providing good guidance and models in this direction (Aldag, personal interview, 1999).

Having more resources available has been the goal of the Marine Preservation Association for some time. Over the past 10–15 years, industry has funded research into use of dispersants as a primary response technique. MPA, in cooperation with various organizations has developed an application process and mobilization services for use of dispersants and now has a standby fleet of aircraft capable of delivering dispersant within 25 hours to all points in the US and it's territorial waters. C-130s and other large aircraft are stationed across the country, in Alaska, Hawaii, Youngstown, Ohio, and Ft. Lauderdale, FLA. MPA is working with the US Coast Guard to establish pre-approval guidelines and plans for use of dispersants nationwide, which could be incorporated into final rules through the regulatory rule making process. Since the window of opportunity of use is so narrow, delivery capacity and pre-approval for immediate use once the dispersant arrives are crucial issues to be resolved. Studies are in place as well to support expansion of the geographic scope of use of dispersant, from the currently accepted deep-water application to implementation closer to shore (Huber, personal interview, 1999).

There is a substantial gap between science and technology in oil spill planning preparedness and response perceived by the international community. Det Norske Veritas has been conducting intensive research and coordinated planning for assessment of risks to natural resources of offshore drilling and production projects in Norway. This research and development has resulted in creation of a methodology for offshore projects, "MIRA", which in time may be applied to risk assessment of oil pollution from vessels. Norwegian legislation requires operators of offshore petroleum activities to define the accepted level of environmental risk, and to carry out an Environmental Risk Analysis as the basis for establishing an oil spill contingency system and plan. The acceptance criteria must be well documented and must address the probability of causing damage to environmental resources, such as seabirds, sea mammals, fish resources, seashore habitats and recreational areas. The risk assessment should identify the risk level as well as prioritized and valued ecosystem components. These demarcations form the basis for specifying appropriate equipment, logistics and personnel to be mobilized in an event. While the system developed is complex, it is based upon sound science and has strong potential for future application to the vessel oil spill situation. Scientific data link classification of unique environments to risk from oil pollution.

- Using a marine resource database owned by several companies and the Norwegian State Pollution Control Authority, species and their habitats are identified, e.g.,

seabirds, sea mammals, seashore habitats, recreational areas, fishing activities and aquaculture.

- Species and habitat vulnerability are assessed and ranked on the basis of available documentation of the effects of oil from past oil spill incidents as well as laboratory and field experiments.
- Species and habitat vulnerability are assessed and ranked using public and scientifically approved values assigned to each population or habitat/community. For example, vegetation and habitat in a wetland may be established as a nature reserve with international conservation value.
- Damage to each species is assessed and classified in terms of recovery time from the incident to pre-spill level or a new level, given natural variations that occur independent of human activity. Recovery time is assessed based upon oil drift calculations, experience from prior spills (resource vulnerability) and resource specific data on recovery capability, such as present population dynamics.
- The methodology takes the combined impact of acute effects of the oil on populations and the likely trajectory and other oil drift calculations and establishes Damage Keys, i.e., oil in a given quantity will cause mortality in a given percentage of the population.
- The Environmental Risk Assessment adds the factor of projected frequency that the impact might occur to these data of Damage Keys.
- Then, the model applies an oil spill contingency analysis, the effectiveness of different spill clean-up strategies and the cost of their use during each of three phases, time of alert, combat and normalization. In the future, efficiency of different oil spill combat strategies will be addressed with respect to risk reduction, i.e., the overall contribution to reducing either probability of damage or the damage level itself. This method allows for consideration of the cost-benefit of different oil spill response management options and provides a better basis for ranking different strategies.
- The environmental effects of use of clean-up technologies are considered in the overall risk assessment, e.g., The effects of use of chemical dispersant on fish resources or the effects of high pressure/hot water washing on seashore communities with respect to natural recovery.
- The ranking forms the final basis for development of a specific Oil Contingency Plan, where the occurrence of unacceptable risks is reduced to the lowest possible, reasonably practical level (Jodestol, personal interview, 1999; 2001).

Such a risk analysis combined with scientific data are not in use for most of the world's oil spill contingency planning. But, the entire process could be applied to the shipping industry, with the end result being identification of certain traffic lanes, where valuable resources are identified as being at risk from shipping and other pollution sources. Oil transport in highly prioritized sensitive areas might be prohibited or strictly controlled. (See Section 5.2 of this book for an example of this in the discussion of the Australian

system.) Other coastal areas could be ranked and prioritized using the risk assessment process, which would identify those areas, which could be impacted most heavily by oil pollution and other risks. The end result might be a more holistic assessment from an ecosystem point of view of all impacts likely to affect populations/habitats. Such a procedure has not been adopted uniformly by governments of various countries nor by the shipping industry. Rather, like Norway, separate companies conduct their own risk assessments, evaluate potential harm from oil activities and make plans on an individualized basis. What is needed is a more coordinated approach globally (Jodestol, personal interview, 1999; 2001).

Once the risk assessment methodology is developed, the system must be taken several further steps in order to be a truly efficient tool, according to Kjell Andreas Jodestol, the senior engineer and marine biologist for Det Norske Veritas, Environmental Advisory services. Governments and regulators need to direct industry based upon the results of risk assessment integrated with the findings of the risk reduction analysis. Instead of simply requiring a massive build up of equipment and manpower by formula, a more effective approach would be to determine in which areas such resources would be most effective in a response given certain parameters. In other cases, current formula generated, minimum regulatory requirements are insufficient to meet response needs. Best response should incorporate scientific, practical, and ecological considerations and follow these steps:

- Define and describe environmental damage of spill scenarios;
- Refine methods of assessment—e.g., Use recovery time as a parameter;
- Classify the efficiency of oil spill equipment and techniques;
- Identify availability and types of equipment worldwide;
- Define character of oil, design criteria, and determine the real worth of equipment;
- Look at the entire ecological functioning of each resource population;
- Consider the cost/benefit ratios for use of specific techniques—evaluate whether risk;
- Reduction is sufficient given the costs to reduce the risk; and
- Use the best techniques for the situation (Jodestol, personal interview, 1999).

What Jodestol is proposing is much like the work performed by NOAA during its damage assessment phase, after a spill occurs, for purposes of restoration, and similar to the newly proposed concept of "endpoints", which focuses upon restoration from the initial stages on of the clean-up. The concept uses data to marshal equipment, response tools, and human intervention in the direction most beneficial to protection of human and natural resource safety (See Sections 3.2 and 4.3.2 of this book for further discussion of NOAA and endpoints.)

The International Tanker Owners Pollution Federation Ltd (ITOPF) and various international teams of scientists assessing oil spills in global waters have conducted a number of studies of the fate and effects of oil, proper application of various clean-up techniques, and the impact of human intervention upon the ultimate recovery of

natural resources. Common themes emerge which support Jodestol's analysis of the gaps between science, technology and response preparedness:

- Understanding of the fate and effects of oil shapes response. "When oil is spilled at sea it is subjected to a number of competing processes, some of which lead to its removal from the sea surface whilst others cause it to persist . . . A knowledge of the processes involved, and how they interact to alter the nature and composition of the oil with time is valuable in preparing and implementing contingency plans for oil spill response" (ITOPF, 1986);
- Decisions made about the type of clean-up involve a range of factors. "These factors include the shore's environmental sensitivity, conservation value, amenity value, and economic importance, and the logistics and costs of possible clean-up practices". While certain environmentally sensitive areas in the world have been assessed and plans developed to guide clean-up, "For the majority of coasts, however, no contingency plans exist and available cleanup options must be reviewed and decisions made in very short times, if interventions are to have any chance of being successful" (Sell et al., 1995);
- The data available, given 25 years of information, are still not complete and creates difficulty in analysis. In certain ecosystem studies there is no definite starting point and no clear endpoint in the recovery process for measuring specific recovery stages. The lack of data can lead to "tentative comparisons" (Sell et al., 1995);
- Biological factors influencing impact and recovery, in certain ecosystems such as coral reefs, are complex, creating conflicting reports of effects on the multitude of plants and animals which make up the habitat of the reef (IPIECA, 1992);
- Even when the data lead to clear "defensible scientific criteria", human values impact levels of response, as in the case of a study informing decisions on clean-up following response for oil spills on rocky shores and salt marshes. "It is recognized, however, that different levels of cleanup may be justified in the socioeconomic context of recreation, tourism, fisheries, aquaculture, visual amenity, birds or mammal. Evaluation of the relations between the socioeconomic and ecological aspects of recovery is recommended as a further area for study" (Sell et al., 1995); and
- The technology available to perform the clean-up still faces varying degrees of limitations. These limitations affect all stages of clean-up, the ability to contain and recover oil, to chemically disperse it or burn it where these tools are allowed, or to physically remove oil on shorelines (White, 1999).

Many in the business warn that these problems in the response systems of the world must be answered if the positive trends in oil spill response are to continue. Gaps in the application of science and technology underline the increasing importance of directing regulation and enforcement toward prevention. Development of the "safety culture" is of the utmost importance, so that the spill incident does not occur in the

first instance. Millions spent on equipment buildup and contingency planning would be better invested on many occasions in improving safe operations of a company (Jodestol, personal interview, 1999).

But, spills are inevitable. Given this reality, the highest priority should be accorded to developing effective contingency plans, flexible enough to respond to the different factors of geography, the fate of oil, and the natural resources to be protected. These plans must be supported by manpower and equipment resources, and effectuated through increasing cooperation between industry and governments/national authorities. Clean-up measures should use techniques designed to minimize harm to the environment and the value of these resources to humans (IPIECA, 1992). Research and Development should be funded on a global basis, such that trial and error is not the basis for response, but rather, scientific study and technological analysis identifies basic principles and formulates lessons learned. An overriding consideration for the success of clean-up operations is that lessons need to be learned (and incorporated into planning) from previous events to avoid repeating past mistakes in future incidents.

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Chapter 3

The Motivators for Change Related to Oil Spills

The motivation of preserving the marine environment has become an important factor in regulating the impact of the passage of foreign ships through coastal states' territorial waters. Today, increasingly the legal framework affecting the shipping industry reflects the public's insistence upon the protection of the ocean and the marine environment.

The *Exxon Valdez* oil spill led to the development of The Oil Pollution Act of 1990 (OPA 90) in the US, with its innovative protection of coastal waters from oil pollution, enforcement mechanisms, including contingency planning to prevent spills, and insistence upon the principle that "the polluter pays", not only for the actual costs of a clean-up, but also for damage to the public's natural resources. The smaller spills, such as the *Berman* barge spill in January 1994 off San Juan, Puerto Rico and the *North Cape* oil spill in Rhode Island in January 1997, have influenced overall US policy and subsequent regulation by states in the US. These and other spills increased public outcry about the safety of US waters and shaped the legislative, judicial and regulatory climate of today. This climate is characterized by civil and criminal liability of the responsible party, aggressive response clean-up operations, and damage assessment for harm to the environment.

Internationally, the *Torrey Canyon* spill in 1967 and the *Amoco Cadiz* spill in 1978 created the first series of conventions aimed at environmental protection. Subsequent oil spills, the *Braer* in 1993, the *Estonia* in 1994, the *Sea Empress* in 1996 and the *Erika* in 1999 led, in the legal arena, to significant revisions of major treaties: the mandatory training provisions and method for creating and demonstrating actual skills by mariners required by 1995 amendments to the STCW Convention, increased Port State control inspection and detention of foreign flag ships under changes to MARPOL 73/78, and the adoption of the International Safety Management Code under SOLAS.

The motivators for change in the paradigm shift to "full" liability of the shipping industry for oil spills are:

- Economic;
- Scientific/environmental;
- Business;
- Legal; and

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The *Exxon Valdez* ran aground on Bligh Reef in Prince William Sound, Alaska on 24 March 1989, spilling 10.8 million gallons of oil into the marine environment. The spill is listed as number 53 on the all-time list of largest oil spills. Photography courtesy of NOAA OR&R Photo Database.

- Public opinion.

These drivers have been defined as "carrots" and "sticks" moving the shipping industry toward "environmental friendliness". "The drivers are 'sticks' like stricter rules and regulations, better technology at competitive costs, improved knowledge, etc .... introducing financial "carrots" like reduced costs for environmental friendly operations, may speed up this improvement process" (Ullring, 1996).

The focus of this chapter is on the influence that the environment is having on the operation of the shipping industry. In terms of the above motivators, the factors behind change are to: reduce response costs, reduce environmental damage, implement "true cost accounting", protect the environment (with the realization that such protection is good for business), adhere to laws, and realize that the consumer and the political system are the public voice. Of the sticks, the strongest may be legal (adherence to laws). Of the "carrots", the primary creator for change may be economics. These motivators are driving the development of regulation, compliance by the shipping industry with regulation, and in many cases for those companies acting with realization that simple compliance is not enough, positive bottom line results of substantial cost savings. Simply stated, protection of the marine environment is of primary importance to sustainable shipping. The best way to achieve this goal is through the creation of a "safety culture" to address the overwhelming problem of human error, with its corres-

ponding detrimental injury to man and his environment. Self-regulation by industry and accountability at all levels of the chain of responsibility define the outcome of the attitude shift.

The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), established by IMO, UNESCO, UNEP and others, believes that: "We should care about the continuing environmental degradation of our oceans and coastal areas because it is detrimental to human health, economic development, and our planet's store of biodiversity" (IMO, 1998a).

Det Norske Veritas, one of the larger classification societies in the world, argues that those ship owners who intend to be in business in the new century will do so only if they adopt the safety culture wholeheartedly. (See Section 3.3 of this book.)

The perilous state of the coral reefs is an example of degradation of the oceans by human activity, both primary impact such as from direct contact from tourism, secondary impact such as from eutrophication, and tertiary impacts such as over fishing or bleaching from warming following global change. Scientists regard the "health and change in diversity" in coral reefs, which are one of the world's most diverse ecosystems, as an indicator of the impact of mankind to bring about deleterious change in naturally stable marine ecosystems.

Their decline in recent years has been dramatic: 10% degraded beyond recovery worldwide, another 30% seriously threatened within the next 20 years (IUCN, 1993).

As of 1990, 2.35 million tonnes of oil from all sources was found to be entering the marine environment with floating oil most commonly found along the tanker lanes and associated with other shipping activities (GESAMP, 1993). This study is being updated by a GESAMP working group, with anticipated results to be announced in the millennium (Etkin, 1999). At its April 1998 meeting, GESAMP issued a strongly worded warning to the maritime community. Degradation of the oceans is occurring on a global scale, resulting often from short-term economic thinking, but producing long-term economic loss of ecosystem functions and services with an estimated value to humans of some $20 trillion annually (more than the entire global GDP). Oil pollution contributes to ocean destruction. While maritime regulations have reduced spills significantly, oil spills continue to happen (IMO, 1998a).

GESAMP committee members believe that there are solutions to this threat to human welfare, health, economic development and planetary biodiversity. The answer lies in "... integrated, sustainable management based on sound scientific information" and the political will to act responsibly:

> "While the resolution of these issues is neither simple nor easy, in most cases the nature of the ocean's environmental problems is understood, the knowledge needed to solve them is available, and the necessary management exists. What is lacking is the determination and political will to act. The active involvement of an aware, informed citizenry can be a powerful force for change on behalf of the oceans" (IMO, 1998a).

The combined effect of the motivators may well provide the necessary impetus for the involvement of each player in the chain of responsibility, leading eventually to successful management of protection of the environment and human safety in the business of transporting oil.

3.1. Reducing Response Costs

Under the "polluter pays" theory, the costs of responding to an oil spill may be significant. One of the motivating factors for "best response" is a reduction in direct and indirect costs associated with oil spills: response, reduced environmental damage, and recovery costs. The ultimate goal of incorporating good science into spill response is minimizing consequences to health, safety, the environment, and, inevitably, a decrease in financial loss to the industry as a whole.

Determining what an oil spill "costs" is a "slippery" and undefined undertaking at best. Assessors face two basic deficiencies in cost data: incomplete information and incompatibility of spill data. The lack of complete data stems from the fact that few incidents have been studied in detail. Publicly available information relates only to some and not all of the costs associated with spills. Many of the private costs remain confidential, so that figures are based more on information collected by federal and state agencies in the US or international organizations like the International Tanker Owners Pollution Federation (Helton and Penn, 1999).

The second complicating factor in determining how much a spill costs is that no two spills are alike, as Jacqueline Michel has often noted (Michel, personal interview, 1999).

Others have also suggested that:

- "All spills are different, and the same quantity of oil spilled in two different locations, or under different environmental conditions, can have different impacts", from $1 to $923 per gallon for total cost (Helton and Penn, 1999);
- "The costs associated with a spill clean-up—and all other subsequent costs, such as environmental rehabilitation and damage claims—depend in large part on the location and timing of the spill, the weather conditions after the spill, and the other unpredictable factors that can just be attributed to 'luck' " (Etkin, 1998); and
- Luck is a chief variable in response. Capt. Ross of the US Coast Guard, speaking of the *Morris J. Berman* 1994 oil spill in Puerto Rico, states: "There are three rules for any oil spill response: Be lucky, be lucky, and be ready to take advantage of your luck" (Ornitz, 1996).

Even given these impediments to accurate analysis, several studies of costs support the working hypothesis that responding to an oil spill is not cheap. Cost categories analyzed include these:

- **Response** costs for the Responsible party (OPA 90) or the ship owner/insurer (under the international conventions), including without limitation, labor and equipment necessary for salvage and lightering, containment and protection of sensitive areas, recovery on sea and land, offshore and shoreline clean-up, waste disposal, and wildlife rehabilitation.
- **Natural resource damages and assessment/reinstatement** for restoring injured resources to pre-spill conditions, compensating for interim losses, and the cost of the assessment process domestically or for the reasonable costs of "reinstatement" of the environment internationally.
- **Third-party claims** generally for property damage, personal injury, lost profits such as lost revenue of tourist operations, fishing operations, and in certain cases, such as *Exxon Valdez*, punitive damages of $5 billion or in the *Sea Empress*, an $8 million fine (OSIR, 1999), later reduced to $1.8 million (OSIR, 2000).
- **Federal and state penalties** for civil and criminal fines imposed by statute or national law. This is discussed in greater detail in Sections 4.3.6 and 4.3.7 of this book.
- **Other costs** referring to the myriad of direct and indirect costs, like vessel loss, salvage cost, repairs, cargo lost, loss of earnings, increased capital costs, interruption in commercial relationships, insurance premiums, lost market share (Helton and Penn, 1999; Etkin, 1998). (See Section 3.3 this book for further discussion.)

A wide range of answers to the cost question resulted from several studies of costs associated with response, natural resources, and third party claims. For US spills (all amounts given are in 1997 dollars):

- NOAA study: Total cost of spills from $1/gallon (*Mega Borg*) to $923/gallon (*Nestucca*), with response costs averaging about one half of the total, and Natural Resource Damage Assessment comprising about 26% of the total cost (Helton and Penn, 1999).
- Mercer Management Consulting: For clean-up and third party damages, an average of $144.00; for natural resource damages, a range between $92.81 and $135.36 per gallon; with an overall cost average of $278.24/gallon or $82,096.56/tonne (Etkin, 1998).
- Oil Spill Intelligence Report: Great variability for spill clean-up costs ranging between $0.37/gallon ($108.78/tonne) for simple manual recovery to $296.29/gallon ($87,110.55/tonne) for labor-intensive, more complicated shoreline operations (Etkin, 1998).
- ICF Kaiser Consulting Group: Based on an average spill unit value per gallon of $51.48, the average overall clean-up costs for a typical incident for tankers and barges/tows/tugs is about $22,000 (USCG, 1997).
- A recent study of clean-up costs for oil spills conducted by Dr. Dagmar Schmidt Etkin of Oil Spill Intelligence Report shows how the factors of methodology, location and timing of the spill, size, type of product spilled and local and na-

tional laws affect the cost of clean-up dramatically. For example, the average cost of cleaning for non-persistent No. 2 fuel gasoline is $3,575.02 per tonne in contrast to a cost of $16,491.97 per tonne for crude oil. While mechanical/manual recovery might yield an average cost of $12,527.34 per tonne, using dispersants as the primary clean-up strategy produces a cost per tonne of $2,501.94. Spill clean-up in the US, excluding *Exxon Valdez*, where there is high value placed upon environmental preservation, for an average clean-up is $73,156.15. In contrast, the average cost for spill clean-ups in South America is $2,158.48 (Etkin, 1999).

For International spills, for those oil spills compensated by the 1971 and 1992 International Oil Pollution Compensation Funds, including the liability of the tanker owner/insurer, the costs vary (see Section 4.3.3 of this book for a discussion of this compensation regime):

- Total costs of actual or estimated admissible claims (using US 1997 dollar conversion of Special Drawing Rights compensation of 1 SDR = $1.35), ranging between a low of $667/tonne for the *Haven* 1991 incident to $180,000/tonne estimated for the *Shinryu Maru No. 8* in the Sea of Japan, 1995 (Grey, 1999).
- In terms of total claims settled for the 1971 Fund between its inception in October 1978 and year-end 1999, for 94 incidents, the Fund paid out more than 243 million pounds. (US $390 million). Claims for the 1992 Fund are in process or estimated only (IOPC, 1999).
- An analysis of major claims (at least $100,000) by the UK Protection and Indemnity Clubs (P&I Club) for 10 years between January 1987 and January 1997 for ship owners or charterers of more than 5000 ships, predominantly ocean going, (20% of which are deep water), yielded 3719 claims of a gross value of $1765 million. As a percentage of all claims, major claims grew from 64% to 72% since 1990 in terms of value and 1.4% to 2% in terms of numbers. They represent a high proportion of impact on all claims (UK P&I, 1999).

What many of these studies conclude is that, regardless of the outcome of the inexact measurement of actual costs, there is a direct correlation between the decision-making process during the clean-up of a spill and the final economic result. “Costs to polluters are not uppermost in the minds of government officials. However, since financial cost and degree of environmental impact are generally directly correlated, most environmentally responsible decisions on cleanup procedures will, in the end, correlate with reduced financial costs to the RP (Responsible Party) as well” (Etkin, 1999).

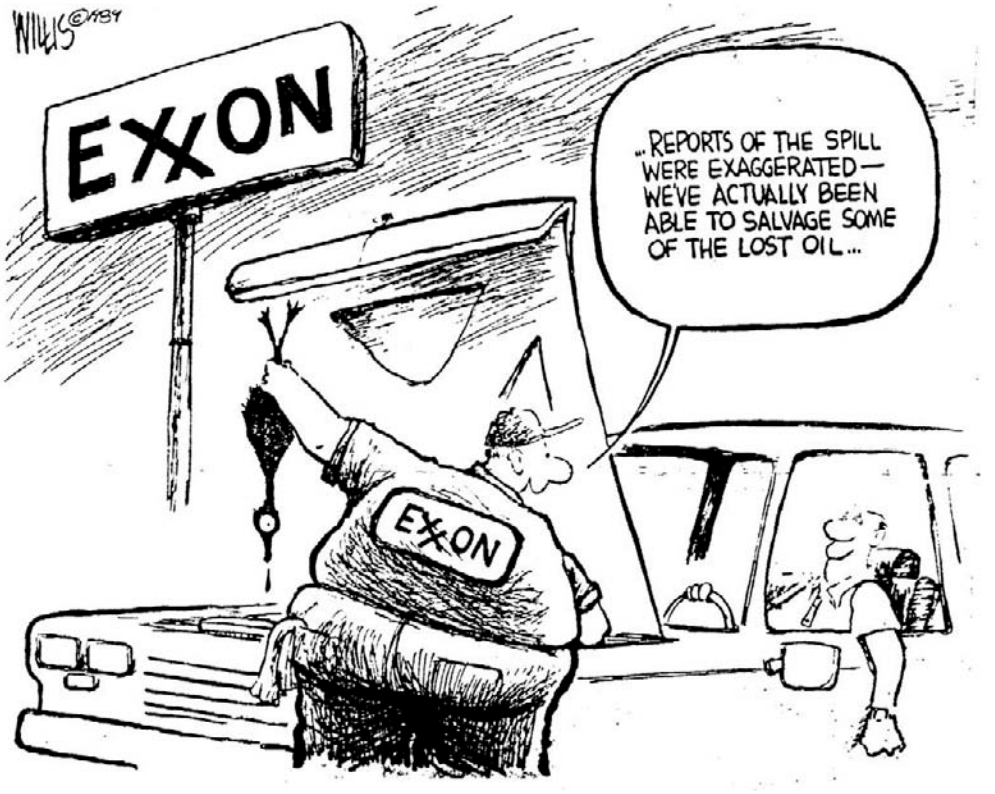
Helton (1997) suggests that responders are faced with a series of policy decisions: about the relationship between response and damage assessment costs, how funds should be allocated between the activities of response and restoration, and whether we are wisely spending our dollars now in oil spill response. He feels that the primary question to be answered is “Should we even make a distinction between response and

restoration, or should they be viewed as a continuum, with cleanup as the first step in restoration"?

The US agency responsible for developing and maintaining regulations governing damages and assessment of the public's natural resources resulting from oil spills is the National Oceanic and Atmospheric Administration (NOAA). NOAA has created a new office, the Office of Response & Restoration within the National Ocean Service, to answer these policy questions. Using $1 million in research funds set aside as restitution from the *Exxon Valdez* spill, this office intends to initiate a think tank of the major players involved in response and damage assessment in order to redefine the process of oil spill response. The project is called "Finding the *Optimum Path to Recovery*". The ultimate goal is to develop a restoration based response strategy that will reduce to a practical minimum the time for environmental recovery by combining the currently separate concepts of response and restoration into one clean-up process. Restoration will act as the bridge between the now distinct phases of response and recovery.

There are artificial gaps between: (1) the use of science in spill response and the damage assessment process, (2) between clean-up and restoration, (3) between scientists conducting studies for each phase of response and restoration, and (4) among the lawyers determining what the polluter will pay. David Kennedy, the director of the Office of Response & Restoration, National Ocean Service, believes that this arbitrary separation inhibits a properly functioning response. What is needed is for both arms of the body to work together to avoid duplication of studies and to limit costs. The think tank approach will involve uniting all stakeholders in exploring the common issues and goals, facilitating the break down of artificial barriers, and creating a shared working approach to response and restoration. The stakeholders include the Federal On-Scene Coordinator, the Responsible Party, the Natural Resource Trustees, and potential third party claimants. Because of the significant number of foreign ships in US waters, the international community is involved. Each of these entities responds from different points of view, which are based on distinct agendas. Education about a common approach must involve each of these players, including a very large stakeholder, the public (Kennedy, personal communication, 1999).

What is urged by Kennedy is a change in cultural perception. Oil spill response should not be based upon disparate agendas nor uneducated public perception or opinion, but rather upon better science and understanding of the ultimate fate and effects of oil in the environment and how to best maximize recovery. For example, in some cases use of high pressure washing to clean rocky shorelines is more damaging than simply letting the natural forces clean the oil. But, because of the need to satisfy public concern and be seen as "doing something", short-term techniques are used, which in the long-term result in more damage to the environment than the actual spill. Kennedy believes that the regulators, policy makers, federal and state agencies, international community, industry, and environmental non-governmental organizations must become involved in changing the perceived antiquated "endpoints" which gov-



By Scott Willis, *San Jose Mercury News*, March 28, 1989.

ern response today. For example, "How clean is clean" in which the term "clean" is defined. The "best practices" approach to be developed will involve each of these players in a working partnership. Their common goal will be to determine what the injury is, what to do to restore it, and then the Responsible Party can devote funds to reaching the ultimate endpoint of a healthy, functioning environment (Kennedy, personal interview, 1999).

A recent issue paper (Lindstedt-Siva, 1999) synthesizes these recommendations offered by the National Ocean Service in its proposed system (Kennedy, personal interview, 1999). Lindstedt-Siva (1999) suggests that the present techniques of improving response performance are focusing on the wrong things, more equipment, more personnel, more planning, and more exercises. The real attention should shift to involving the concerned stakeholders in advance of a spill, including members of the public, in the process of determining appropriate criteria to define a successful outcome of response. She feels that the stakeholders should judge the spill response performance during the crisis against these endpoints. Communication, education and

trust building among stakeholders are key to implementation of a better, more cost effective response (Lindstedt-Siva, 1999).

How will such a program equate to cost savings? The "Optimum Path to Recovery" should result in a quicker, more efficient, response to environmental recovery conducted by a leaner response organization, with less duplication of effort in terms of studies and activities, and quicker payment of claims. Costs should reduce dramatically. Scientific and economic studies about what is an optimum response will be part of this three to four year research project (Kennedy, personal interview, 1999).

Members of the response community support this cultural reorientation. The best practices approach complements the work of Capt. Hereth and others of the US Coast Guard in their development of "best response" (See Section 2.3 of this book for further discussion.) The new system will:

- Move from being a process-based to an objective-based response;
- Develop measures of success based on reducing elapsed time between recovery and the magnitude of natural resource impairment pending recovery;
- Integrate injury assessment with response; and
- Involve all stakeholders during the early stages of the clean-up.

Although there has been much concern on the part of the international community in the past with the manner in which the US conducts its response, at what has been regarded as staggering costs, this movement toward incorporation of the restoration needs into clean-up operations from the beginning, is more reflective of the international approach to oil spills. According to Admiral Kime, former Commandant of the US Coast Guard, and now serving on the Executive Committee of BIMCO, the world's largest shipping association, David Kennedy's approach is receiving international approval. The result is that the contentious elements of the natural resource damage assessment process (NRDA) may be on the way to resolution (Kime, personal interview, 1999). (See Section 4.3.2 of this book for discussion.)

Kennedy believes that the following components are needed in order to create a workable system for optimum recovery in oil spill response:

- Research to establish qualitative measures of recovery;
- Guidance that describes strategies for using science during response (e.g., "Technology Windows-of-Opportunity" approach);
- Simulation models to evaluate optimal response strategies,
- Training of responders in how to use new methodology and this approach; and
- Testing the effectiveness of response strategies by replaying past spills, for e.g., comparing the clean-up methods used in *Exxon Valdez* with what other methodology might have been more appropriate (Kennedy, personal interview, 1999).

One other commentator suggests a different way to look at costs, which is in keeping with the "Optimum Path to Recovery" approach. Capt. Harlan Henderson, former

Commanding Officer of the Marine Safety Office of the US Coast Guard, San Francisco Bay, California, proposes following the lead of US Coast Guard Search and Rescue assessors. Their statistics value lives and property saved. The attempt in oil spill cost analysis should be to determine how much environmental damage was prevented from occurring by the response measures undertaken. For example, the *M/V Kure* oil spill in Humboldt Bay, California in November 1997 could have impacted significantly environmentally sensitive areas in both the North and South Bays. The US Coast Guard, at some expense, took aggressive actions to protect these areas, particularly the oyster beds, by booming and other strategies. Birds were treated and released. If such activity had not been undertaken, the NRDA claims would have increased exponentially. Capt. Henderson summarizes the approach to defining cost: "The bottom line is that we should be able to say that, although the spill cleanup cost *X* dollars, by taking the actions we did, we prevented *Y* dollars of damage to the environment. The goal is to minimize damage to the environment and not purely minimize the cost of cleanup" (Henderson, personal interview, 1999).

Etkin, (personal communication), makes compelling points about the pivotal issues involving costs and clean-up:

- Cleaning up oil spills costs the polluter significant money;
- Public concern and the localized environmental elements dictate how much;
- Reducing costs means using good science (like that espoused by David Kennedy) in the front end, coordination of all stakeholders, and protection of sensitive areas to minimize their damage; and
- *Prevention is the best way to reduce costs.*

Since the enactment of OPA 90, there has been a continuous downward trend in oil spillage in the US and internationally. This reduction cannot be completely attributed to the more stringent regulations associated with this legislation, since many of the new regulations have not yet been implemented fully and certainly are not in effect outside the US. Rather it appears that the fear of tremendous costs associated with clean-up and damage suits like those realized in the *Exxon Valdez* spill of 1989 has influenced industry's responsibility. Indeed, the costs associated with cleaning up spilled oil can be formidable. Clean-up costs, even on a per-unit basis, vary tremendously with the circumstances of the spill. But, experience has shown that like real estate, the most important factors determining cost are location, location, location! A spill of any size in an inopportune geographic location and time near a prime tourist beach a week before the high season, in a sensitive wetland during fall bird migration compounded with a highly motivated public translates into serious clean-up expenses for the spiller.

> "Money well spent on an effective clean-up based on a net environmental benefit analysis conducted by scientific experts, extra efforts made to keep the spilled oil out of environmentally sensitive and sociallyvalued locations, along



By Branson, *Arizona Republic*, reprinted in *The Sunday Review*, May 7, 1989.

> with diligent cooperation with state and federal authorities will go a very long way to significantly reducing the thirdparty claims, natural resource damages, and immeasurable public relations problems. And, of course, in the long run, investments in oil spill prevention or minimization will be the most effective cost reduction strategy and have the most net environmental benefits" (Etkin, personal interview, 1999).

The response community appears to be evolving toward a more cost effective, efficient, and optimal response strategy for the environment. Much work remains to be done. This shift in orientation will require time to convince all the stakeholders that a unified approach, integration of good science with law and policy will achieve the objective of returning the damaged natural resources to a functioning environment with minimum risk to human health and safety. How the integrated "Optimum Path to Recovery" will ultimately impact the cost to the Responsible Party and others remains to be determined. An even more radical shift in orientation may be to move away from judging cost on a clean-up cost per barrel and instead, to adopt the approach of judging cost on how much response activities saved in terms of environmental damage and third party claims.



By Pat Oliphant, the *Daily Review*, April 5, 1989.

3.2. Reducing Environmental Damage

Reducing environmental damage is a primary motivating factor behind the integration of science and technology into a new response culture. Members of the scientific community endorse the approach. NOAA Scientific Support Coordinators who assist the Federal On-Scene Coordinator during oil spill response are rethinking spill response in terms of determining appropriate clean-up "endpoints". Currently, they have focused their attention upon shoreline clean-up. There are clear goals behind the reorientation of the clean-up process: minimizing human health hazards, assisting the natural recovery process, and reducing prolonged negative impacts to resources. Rather than taking the approach that any action is better than none and that all oil must be removed, the new system contains a series of "endpoints" or recovery objectives based upon identifying the different shoreline habitats, describing the desired endpoint, monitoring and evaluating the progress of work in the field, using good science in the clean-up process and modifying clean-up recommendations as necessary. Aggressive and inappropriate techniques are to be avoided in favor of those which remove the oil posing the greatest risk and which maximize recovery. Avoiding the unintentional outcome of the clean-up process eliminates the cost and longer-term harm caused to the environment.

The end goal of this viewpoint is not necessarily an oil-free environment, but rather one that is ecologically functioning. So, for example, in the case of a heavily oiled mangrove swamp, the endpoint may be removing heavy oil only on the edge, rather than causing more damage by disturbing sediment and the mangrove ecosystem. After the initial removal, the natural cleansing and recovery process over time can work to remove the balance of the oil. This endpoint is described as "oil removal to allow recovery/recolonization without causing more harm than natural removal of oil residues" (Michel and Benggio, 1999).

Jacqueline Michel has provided technical and scientific support to NOAA since 1978 and makes site visits to perhaps 50 to 100 oil spills annually. She regards this work on shoreline removal as a beginning point in a much more involved process. Based upon her extensive experience, she concludes that the cost of clean-up does not accurately reflect the true risks involved in dealing with the environment. All disciplines, economics, politics, and science, need to be involved in response and restoration from the beginning. What is important to her is the willingness of all players (an attitude shift just forming) to integrate science, like the advice provided by the extensive experience of NOAA advisors to the US Coast Guard, into the response at all phases (Michel, personal interview, 1999).

The use of this common viewpoint, based upon good science, should provide responders with a clearer and more systematic approach to the process. Responders begin the spill response keeping in mind the endgoal of restoration. Two examples from recent spills demonstrate the value of this reorientation. In the *M/V Fortuna Reefer* incident of June 1997, where a freighter grounded on a pristine coral reef, in Puerto Rico, the Responsible Party agreed to an immediate and emergency restoration of the reef. Living corals were actually implanted by complex technology back onto reef substrate. The cost of the restoration project was approximately $1 million, a much less significant cost than waiting, conducting a damage assessment, and later, undertaking some other reef restoration project. The reef is slowly, but surely recovering (Michel, personal interview, 1999).

Another example of reducing environmental damage through integrating restoration immediately into clean-up is that of the spill in February 1999 in Oregon, by a Japanese ship, the *New Carissa*. Although the ship was burned in situ to secure the source, between 125,000 and 220,000 gallons of oil were estimated to have released into the water. Approximately 35 individuals of one species of shorebird, the Western Snowy Plover, suffered heavy oiling. This is a locally monitored and federally threatened species. The Responsible Party agreed to take effective, emergency restoration action by (1) protecting nesting sites with cage structures so that the eggs could survive predation from gulls and ravens; and (2) hiring enforcement personnel to monitor and patrol the beaches, keeping dogs and people away. This action increased hatching success and allowed the precocious young, who feed in the intertidal zone, to do so without disturbance and without starving to death. By looking at the ultimate purpose, recovery of this impacted species, early in the response and

by advancing several hundred thousand dollars in the front end, the Responsible Party diminished damage to the shorebird resource and saved itself significantly greater costs in the long term. The measure of damage under the Natural Resource Damage Assessment process in this case would have included reduced productivity of chicks (Michel, personal interview, 1999).

One of the crucial components in developing appropriate response strategies is to test the effectiveness of a particular response action by revisiting past spills and analyzing procedures used against recovery rates. For example, comparing the clean-up methods used in *Exxon Valdez*, with what other methodology might have been more appropriate, should help to identify the positive and negative aspects of scientifically based response (Kennedy, personal interview, 1999).

The *Exxon Valdez* oil spill may be one of the most intensely studied spills of the century, as analyzed by the scientific community and by industry. In the 10+ years since the 1989 spill of eleven million gallons of Prudhoe Bay crude into Prince William Sound, Alaska, scientists have examined the flora and fauna to determine the impact of the response process upon the ultimate recovery of this ecosystem. The results of these analyses are instructive for policy considerations about how proper the use of response/recovery methods and post-spill monitoring might shape the return of oiled environments to their formerly, functioning state.

- While not all studies agree, there is "some" consistency as to findings: Opinions as to recovery differ from paper to paper, even where the study was conducted within the same agency.
- Surface oil at study sites disappeared by 1992. Residual oil below the surface of sheltered beaches and beaches where oil penetrated deeply and was not removed still remains. The remaining oil contains fewer compounds in lower concentration levels with reduced acute toxicity and is more tolerable to many intertidal species (Hoff and Shigenaka, 1999; NOAA, 1999)

Using a statistical test similar to a time-by-treatment ANOVA ("parallelism"), scientists compared the similarity of upward and downward trends at impacted and controlled sites. They concluded that for common intertidal algal species, such as *Fucus gardneri* (rockweed), species abundance was initially depressed at oiled sites with greater impact at cleaned sites than uncleaned sites. But, these short-term impacts became less significant with time, such that the patterns of abundance were effectively the same from 1991 on, indicating recovery at all sites (Hoff and Shigenaka, 1999; NOAA, 1999)

Applying the same analytical method to infauna, the animals living in gravel beach sediments, yielded a different result. There was the same rapid increase in abundance of species before 1993 with an ongoing period of "parallelism". But, despite a return to trend patterns similar to that at unoiled sites, actual numbers, abundance, at oiled and washed sites were less than at unoiled sites, an indication of non-recovery (NOAA, 1999).

One suggested cause for the infauna impact is that the washing process (hot wash) removed important silty material from the beaches, which the infauna depend upon. Thus, the response actions themselves may have contributed adversely to altering the habitat of these organisms at oiled and cleaned sites (Hoff and Shigenaka, 1999; NOAA, 1999) yielding:

- Correspondence analysis revealed a highly significant relationship between infauna and the very fine sand fraction of associated sediments. Aerial photography taken during beach clean-up in 1989 showed that pressure washing of beaches removed large amounts of fine sediments. This physical change has been hypothesized as inhibiting recovery of infauna to the affected beaches (Shigenaka, personal communication, 1999).
- Another study disagrees and attributed the impact on recruitment (a drastic reduction) for intertidal grazers such as limpets and snails to the oil itself (Duncan and Hooten, 1996).
- The authors of these studies are careful to point out that there were a limited number of study sites used, and that their findings apply only to those studied sites (Hoff and Shigenaka, 1999; NOAA, 1999).
- Natural recovery in itself is not always the best response. Enough oil must be removed in order to allow natural recovery the best opportunity to work most effectively. Removal was needed in the *Exxon Valdez* spill. When and how much human intervention is enough is the open question. Oil residues pose a serious risk to biological availability and vulnerability. The focus must be upon the level of cleaning of oil in order to significantly increase the overall volume of oil recovered. Removal and recovery are the desired goals (Michel, personal interview, 1999).

Studies of fish and wildlife recovery reveal the same mixed messages, recovery, non-recovery, and sometimes more negative impact from human intervention techniques than if the sites had been left alone:

- Pink salmon show no effects attributable to spill hydrocarbons in each of their key life cycles, and in fact, experienced record years of abundance after the spill (Wiens et al., 1999);
- Sea otters experienced high initial numbers of mortality, but since 1991 sea otter abundance and production indicates that otter distribution is not significantly different from before the spill and "food habitats remained unchanged" (Wiens et al., 1999);
- Harbor seals have not fared as well, with a substantial number of "missing" adult seals from large haulouts at oiled sites. Twenty-six percent of pups born at oiled sites died. However, missing seals might not be dead, but rather may have moved away from the haulout sites due to significant human activity. In 1989, there were 11,332 people involved, 85 aircraft, 143 watercraft. Human disturbance may have led to displacement of seal population (Wiens et al., 1999);

- Seabirds fared well in some cases, with 43% of the 23 species surveyed showing no evidence of impact, 4% showing positive response and 52% showing evidence of initial impact with varying rates of recovery. Overall, there has been a recovery of marine birds who were initially impacted by the spill (Wiens et al., 1999)
- Other peer-reviewed studies reported in the *Exxon Valdez* 10-year science symposium indicate negative impacts on fish and wildlife: sea otter abundance differences between oiled and unoiled areas which cannot be explained by differences in food availability; cytochrome P450 analysis in otters indicating exposure to hydrocarbons in oiled areas; bird recovery not being as positive as indicated in Wiens' findings (Shigenaka, personal communication, 1999).
- Studies conducted 10 years later of shoreline conditions in Prince William Sound (Gilfillan et al., 2000, and the citations therein) have found that statistical analysis of the data found "no indication of continuing oiling effects in 1998".
- Page et al. (2000) found that in offshore sediments of Prince William Sound and the Gulf of Alaska, that residues of associated seep oils are the dominant sources of hydrocarbon background rather than area coals or residues from the *Exxon Valdez* oil spill.

Books can be filled with the papers written about the estimated short- and long-term social, economic and environmental impacts of the *Exxon Valdez* oil spill. The real problem is that it is difficult to get funding to conduct a baseline environmental or "before" study for a projected catastrophic event so that comparable data are available. Progress has been made in funding baseline studies in the area of oil production platforms, because the economics of the resource under development and the natural resources at risk allowed for such studies to become an affordable regulatory requirement. Unfortunately, the public which benefits from the transportation of oil does not appreciate that environmental areas that are adjacent to or serve as shipping lanes are also revenue generators. The IMO Treaty to ban TBT may change this perspective because of the cost for treatment and disposal of TBT contaminated dredged material (Champ, 1999, 2000).

The most important conclusions of these various studies centered upon ways to improve spill response by using science in a way that leads to better understanding of the physical, chemical and biological processes involved in recovery. The goal is to reduce/minimize environmental damage. Then, lessons learned from the *Exxon Valdez* studies (and others) can be applied to future spill response. These points emerge:

- Assessment of impacts from an oil spill is difficult in high energy and highly dynamic ecosystems, because of the constant changes inherent in the systems, the natural variability, and the resiliency of many of the study subjects to a harsh environment. There is a "moving target" of recovery. Standard methods of assessment may not apply nor yield valid results (NOAA, 1999).
- "Set-aside sites", sites which were oiled but intentionally left uncleaned, are necessary to discern impacts due to oiling alone and those due to clean-up. While

leaving such sites uncleaned is difficult due to public, political and other pressures, this methodology is crucial to the validity of analysis (NOAA, 1999).

- The response itself can significantly impact the recovery of near-shore ecosystems. While hot-water, high-pressure washing has a use, it must be applied with greater caution along vegetated shorelines, in soft substrates and elsewhere. Human activity may itself cause greater disturbance to species than the initial oiling (NOAA, 1999, 1999a).
- Response may cause harm, but this does not mean that the entire affected area should be left to natural recovery. Careful study must be conducted of the type of response to use and when such use will effectively aid recovery. Enough oil must be removed in order for natural recovery to occur quickly. For example, in the case of a long-term study of the effects of oil spilled on mangrove roots in the Bahia Sucia, Puerto Rico, scientists concluded that oil stress appears to affect root membranes directly, leading to the recommendation that there is a "window in time" between initial impact and plant damage when oil penetrates sediments. During this period, proper mitigation actions could impact overall recovery of the mangrove trees (Gilfillan et al., 1999).
- An understanding of the physical characteristics of the environment impacted is necessary for utilization of proper clean-up techniques. The physical features affect the biological communities. "Physical recovery and stabilization of a site are necessary for biological recovery". Similarly, alteration of the physical site, such as occurs when hot-washing removes fine, but necessary sediments, may impact the ability of the biological species to return to that environment (NOAA, 1999).
- Post-spill studies are crucial to a continuing and effective understanding of spill response. Control sites need to be established, leaving oiled areas uncleaned, for effective analysis. Design of studies and analyses merits careful attention, both of underlying ecological assumptions and the methods used to determine impact and recovery (Shigenaka, personal communication, 1999; Wiens et al., 1999).
- While many shorelines, like those involved in the *Exxon Valdez* and *Braer* spills recover remarkably well within a reasonable time, in part due to the fact that they occurred in high energy environments where high sea states of waves and wind, soft substrates like peat bogs, mangroves, certain beaches have very slow rates of recovery. In these areas, efforts should center first upon protection from impending oil as the highest priority and then, upon finding more effective techniques for removal of the oil. Certain techniques, such as using approved dispersants, like Corexit 9580 in the *Morris J. Berman* spill in San Juan, Puerto Rico or another shoreline cleaner developed during *Exxon Valdez*, have proved very helpful to cleaning sensitive shoreline and mangrove root areas (NOAA, 1999; Hoff and Shigenaka, 1999; Teas et al., 1999; Shigenaka, 1999).
- Even where large-scale studies like those conducted in *Exxon Valdez* are not possible, "small science" (Mearns and Simeck-Beatty, 1999) will aid responders

by allowing scientists to check their assumptions, six months to even a year after initial clean-up activities are concluded. For example, in the *New Carissa*, Oregon spill, scientists assumed that, after tarballs of a certain size were removed from beaches, the balance of the oil would be cleaned by storms and natural recovery. Studying the site a season or a year after, would either confirm this assumption or not. Responders can learn from past efforts and be "smarter for the next time". Such studies do not have to be expensive nor complex. Sometimes, time series photography of oiled sites is sufficient (Michel, personal interview, 1999).

- Research of oil spill needs should be conducted to make in the field of performance assessments of different technologies and to assess environmental effects under in-situ selected oil spill and environmental conditions (Lindstedt-Siva, 1994).

The challenge to the international community may be not to take studies such as conducted by Kingston (1999) of the *Braer* oil spill as evidence that natural recovery is the best or only option in terms of many response incidents. In *Braer*, twice as great a spill as *Exxon Valdez*, the studies three and four years later indicated almost complete recovery of the marine environment, with little measurable impact in rocky subtidal habitats nor in sediments where large quantities of oil accumulated and might have impacted the benthic infauna. Researchers attribute the lack of damage to an initial low impact of the oil itself in and around the site and to a strong belief that "... damage from oil spills is relatively short-lived and that their effect on populations is usually small compared with the great fluctuations that result from natural causes" (Kingston, 1999). *Exxon Valdez* research and studies of the *Bahia Las Minas* spill in Panama in 1986 indicate that the impacts of oil may indeed be long term for certain types of ecosystems with great damage caused to individual species.

Rather than a blanket acceptance that natural recovery works in every case, without much if any human intervention, a more restoration—oriented approach could be taken. What is needed is a fuller understanding of the particular ecosystems involved and correct application of science and technology in response with clearly defined "endpoints". The endpoints themselves are created based upon analysis of the impact upon recovery of selected clean-up techniques. Then, the polluter should fund rigorous and careful post-spill, long- or short-term monitoring to determine the impact, not only of the spill, but also of the recovery/response methods used. This monitoring would allow scientists to test the assumptions upon which approaches were taken and lead to valuable information that could be incorporated in future spill response.

There is a joint effort between the United Kingdom's Natural Environment Research Council, the International Group of P&I Clubs, the International Tanker Owners Pollution Federation and the Department of Marine Sciences and Coastal Management of the University of Newcastle in the UK to study the impact of vessel groundings on coral reefs around the world and to learn more about the dynamics of the reef recovery process. The lessons learned and scientific data acquired from

this study can be used later in damage incidents to choose appropriate restoration actions, evaluate costs and shape the course of future reef recovery. This is a long-term study that will have an ultimate impact upon reducing environmental damage. This international effort deserves recognition and praise (ITOPF, 1998).

Another lesson learned from *Exxon Valdez* may be to use an alternative approach, offsetting protection by purchasing and then leaving alone important coastal and upland habitats. This is a restoration alternative provided for under the US natural resource damage assessment policy, although not a preferred one, but one which is totally foreign to the international scheme. (See Section 4.3.2 of this book for further information on NRDA.) Restoration is the preferred/encouraged approach under US regulations. The *Exxon Valdez* land purchase was an exception, not the rule. In the long term, reducing environmental damage may require all stakeholders in response worldwide to embrace new approaches: scientifically based restoration endpoints and alternative restoration planning.

3.3. True Cost Accounting

The concept of "True Cost Accounting"* is a composite term, combined from two economic expressions: determination of the "true costs" of oil spills (USCG, 1997a) and application of a cost/benefit accounting which compares the benefits to be gained by avoiding such losses through institution of the "safety culture" in a business (DNV, 1996a, b; Sheehan, 1997). Use of this concept is valuable where societal and "external" direct costs are involved as well as indirect costs and/or costs which are hard to assess. Often the indirect costs, such as the impact upon public opinion of the oil spill, affect a company's bottom line. A viable industry should be able to measure all costs associated with an oil spill and then institute such preventive actions as are necessary to avoid such costs.

One of the most important challenges for the maritime industry is whether shipping companies will embrace the concept that protection of the environment is "Good business". What this policy shift requires is the adoption of the International Safety Management Code reliance upon quality of management in all aspects of ship operation, infusion of money into maintenance, upgrading of ship systems, training of qualified individuals, and employment of professionals, not "cheap crew" (For more information, see Section 3.5 of this book.)

In other words, money spent in the front end saves mega dollars spent later. The *Morris J. Berman* spill in 1994 is a sad example. A $9000 towline replacement would have avoided an $87 million dollar spill, and the $75 million dollar fine levied against

* "True Cost Accounting" is a term derived by the first author from USCG studies (ICF, 1997) of true costs and tagged to those words "accounting" as most of the other studies analyze costs/benefits—revenue vs. waste through an assessment or accounting methodology (such as DNV, Anglo-Eastern, National Pollution Funds Center, etc).

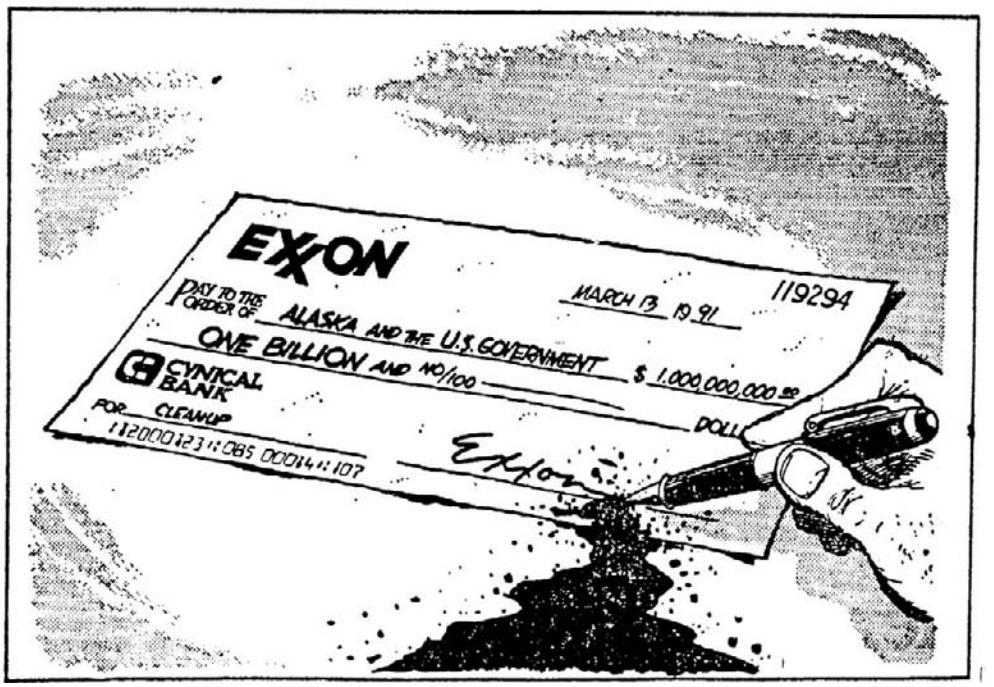
the subsidiaries and parent company involved, and the CEO sentenced to a jail term (Ornitz, 1996). Oil spills result in tangible, direct losses in life, injuries, damage to the environment, cargo, and vessel, loss of time, loss of consumer base, and many indirect costs. Perhaps most significantly, a spill can mean loss of freedom due to criminal imprisonment.

The question for the industry in this next century is which choice will the ship owners and operators make? Will they evade the new international standards and civil and criminal liability risk, simply comply by doing only what is expected of them, or embrace the "safety culture". Det Norske Veritas, (DNV) one of the three largest classification societies worldwide, has undertaken a systematic analysis of the current industry attitude toward proactive safety and environmental concerns. DNV classifies these views into three categories:

- "The *Evasion culture*: companies who do not take recognized international standards seriously and even have a good feeling when succeeding in evading them.
- The *Compliance culture*: companies who do what is being expected of them.
- The *Safety culture*: companies who believe in a continuous and never-ending improvement process as a means to promote productivity and profitability" (Ullring, 1996a).

The goal of the maritime industry should be to develop the safety culture mentality. In this culture, all of those engaged in shipping oil, foster the belief in responsible management, captains, and crew. Embracing this philosophy will require a change in how business is conducted. The current more passive, inspection culture relies upon regulatory inspections to find the "problems", fix the symptoms without determining what the true root causes are, and reacts with suspicion and disbelief toward regulators. The regulators in turn rely heavily on the traditional system of primarily technical compliance, through inspection. The focus of a safety culture is dramatically different. In addition, the safety culture to be highly effective requires a continuous learning process over time by each involved participant. This includes incorporation of lessons learned, proactive activity that addresses root causes, and not temporary fixes, and a real appreciation and understanding of the value of responsible management. The indirect effect is protection of people and the environment (Evans, 1999).

What does this shift in ideology of the safety culture cost the shipping or oil industry? An often cited response is "...If you think safety costs, try an accident" (Ullring, 1996). The other answer is to ask Exxon (now ExxonMobil) about the *Exxon Valdez*. Many in the industry have attempted to evaluate these *other costs* or external or indirect costs of response and NRDA costs associated with vessel accidents in order to answer this question and to see just how much preventive, safety-oriented programs can save the Responsible Party, the ship owner or the shipping community (see discussion in Section 3.1 of this book). While there are caveats about the reliability of certain of the numbers, there is certainty as to the categories or types of losses



Anonymous, *Commentary AP*.

experienced as a result of spills and human accidents. The general range of costs is conservative rather than being overstated (USCG, 1997a)

One of the primary studies relied upon by the US Coast Guard for justification of its Prevention Through People Program was prepared by ICF Kaiser Consulting Group, Inc, (USCG, 1997a). This study is a comprehensive assessment of costs, entitled: "The Economic Impacts of Accidents on the Marine Industry", (USCG, 1997a). The report focuses upon direct and indirect costs for all types of vessels and facilities. For purposes of answering the indirect cost question related to oil spills, we in this book have only cited below (as example costs) those figures relating to vessel incidents under the cost categories identified. (Note: estimated values are reported in 1997 US$. The average market price of gasoline used is for the value of lost oil carried as cargo, $.57/gallon spilled. Spill size is measured as small—less than 10,000 gals, medium—10,000 to less than 100,000 gallons, or large—100,000 gallons or more.)

Example of estimated direct costs

- **Value of lost cargo:** (For petroleum as cargo or fuel), based upon tankers serving the United States for small coastal spills—$247 per spill event for tankers, $250 for barges; for medium size coastal spills—$5000; for large spills—more than $50,000 per spill.

- **Property damage loss:** Loss of vessel, loss of equipment, (based upon over 2000 vessel and facility incidents between 1993 and 1994), barge/tow/tug losses excluding the *Morris J. Berman*, average damage of $69,675 per incident; tanker losses average damage of $292,009 per incident. Hull insurance may cover some or all of this cost.
- **Litigation expenses:** Including attorney's fees, expert witness fees, professional consultant time, and administrative and other overhead support, in spill incidents of more than 10,000 gallons, barge/tug/tow averages $99,701 per incident to $55,774 per incident for tankers.
- **Injury and fatalities:** Including medical expenses, compensation for lost time, wage and productivity losses, administrative expenses, and employer costs of training replacement employees, production slowdowns, investigation time, overtime for uninjured workers, for injuries, averages $28,840 for barge/tow/tug per incident, $29,960 for tankers. Death costs per death incident average $829,500 for barge/tow/tug and $1,240,300 for tankers.
- **Indirect costs:** These accident related losses are harder to quantify, but they equate to an increase in direct costs, using a *conservative multiplier, of 2.7 to 1*. These losses include reduced worker morale, lower economic incentive for good performance, poor relationships with customer base, cost to hire and train replacement personnel, and less productivity, when an injured worker returns after an accident. The magnitude of this category is significant in the total loss picture. For every $1 spent directly for an injury in direct costs, such as medical or insurance compensation, it is estimated that an additional $1 to $3 will be spent for indirect costs.
- **Hidden costs:** This category relates to losses associated with diversion of resources from their intended or normal business uses. For "true cost accounting", this economic drain on a functioning company must be considered:

  - *Insurance:* Hull, cargo loss, pollution protection insurance are available to ship owners, but these policies are not free, nor are they cheap. Accidents increase the cost in the form of insurance premiums, deductibles or co-payments. Additionally, the dominant insurers in the shipping industry are the P&I Clubs, groups of ship owners and charterers who pool their monies. A loss to one is a loss to all under the mutual arrangement. The UK P&I Club reported this cost to industry for a 5-year period (1987–1991): 1444 major claims totaling $784 million. DNV reported company claims for 17 incidents per year, costing the shipping industry an average of $10 million per year. Deductibles range between $45,000.00 and $250,000 for hull and machinery claims, on average per year.
  - *Interruptions in operations:* Downtime for otherwise income producing ships could approximate $35,000 a day lost revenue for a 100,000DWT tanker.

- *Vessel at the dock:* Excluding contract charter fines, one manager of a major oil transportation company estimates $40,000 per day for dock fees, off hire time, and daily wages while the ship is berthed (Rowland, personal interview, 1998).
- *Financing:* While not calculated, the company is losing capital which would otherwise be earning money and consuming capital reserves not being replaced.
- *Public notoriety:* In a spill of any significance, not only are costs incurred in personnel and administrative time to combat a bad public image, but also significant losses occur in terms of lost market share. Commercial relationships with the customer base may be negatively impacted.
- *Permitting/inspection process:* Those vessels with poor accident records may find themselves targeted for more inspections by the numerous entities involved in all systems inspections, which audits mean lost time, cost for personnel involved, and lost business opportunity. Additionally, permitting and certification procedures for such ships may consume much more time (USCG, 1997a).
- *Stock prices:* Severe incidents impact the stock value of traded corporations. An analysis of 13 severe accidents in US refineries reflected a stock devaluation of between two and five billion dollars. Conversely, Standard & Poor's listed 14 companies who won the Malcolm Baldrige award as quality companies. Between 1988 and 1996, these companies averaged earnings four times greater than the market as a whole (Card, 1996).
- *Reduction of ship lifespan/damage to machinery:* Improper maintenance and actual damage to ships and their functioning equipment is costly (Cremers, 1996).

The ICF report concludes with some staggering total cost numbers:

- For the tanker sector of the marine industry, the total annual cost of incidents was $37 million, and for the barge/tow/tug sector, $122 million, excluding hidden costs not factored into the figures and using a conservative indirect multiplier of 2.7.
- The total cost for all cost categories combined for all vessels involved in marine incidents annually exceeds $581 million dollars (USCG, 1997a).

Another source believes these numbers to be extremely conservative. Estimates for all marine casualties in the US alone are in excess of a billion dollars each year (Card, 1996; USCG, 1997b).

For the individual company, safety losses have even greater significance. "For a company with a 5% profit margin the cost of a safety loss must be made up 20 times in increased sales to cover the initial loss". Complicating this picture is the loss of market share, lack of credibility with commercial users, and the public's loss of faith

in the entity. These factors increase even more substantially the ability of the company to make up its losses (Ullring, 1996).

"True cost accounting" is not insignificant in terms of the future of the maritime industry. The other side of this coin is how much prevention saves the good operator (to be discussed in the next section). Substandard operators, those who are the weak links in the chain and who refuse to adopt the safety culture cannot afford to sustain losses of the type enumerated above. If not put out of business by their peers or by regulators, fines and criminal imprisonment, one significant spill may mean that their business operations cease. This is the bottom line reality of true cost accounting.

3.4. Protection of the Environment is Good for Business

True cost accounting exposes the direct and indirect costs of oil spills, with direct costs, being only the tip of the "accident cost iceberg". The true costs to industry include the hidden and less identifiable costs. The most aptly stated conclusion to be drawn from such a complete reckoning is found in the adage: "an ounce of prevention is worth a pound of cure". Today's shipping industry, for its own protection, must adopt a safety culture, focus on proactive safety and prevent as many accidents as possible from happening.

True cost accounting methods add to the understanding of the real and total costs. Industry needs to know the true costs of accidents in order to determine cost savings, which would result from successful implementation of comprehensive accident prevention programs. Safety management programs not only protect people, but they also protect the environment. They translate to a better company bottom line (Ullring, 1996a).

Safety management can be an integral part of quality management. Implementation of quality management provides the leadership of a company with the ability to analyze problem areas and strategically plan for safety. Such planning includes the analysis and reduction of data from ship operations and production of useful information about the factors influencing risks. By using a systematic safety approach, management can decrease the otherwise large gap between results and expected performance standards and can produce a workable, strategic plan for safe operations. Randall Gilbert (1997), a maritime consultant and co-founder of the Center for Maritime Leadership, has studied the cost/benefit ratio for companies invested in "optimum", and not just minimum regulatory safety strategies. His conclusions are "that safety is good for business and that self-regulation pays". He feels that:

- "As safety decreases below minimum regulatory standards, the costs incurred to the company increase exponentially;
- A composite curve depicting the costs to create a safety management system and the benefits accruing to the company from such a system reveals an overall

advantage from using a safety management strategy at the "optimum" level of safety (above regulatory minimums). As the safety index increases, the reductions in losses outweigh the costs incurred to achieve the higher safety standard; and

- A safety system at higher than minimum levels controls cost variations. These variations exist at all levels, but they are of less impact in a functioning optimum safety system. An example of an uncontrolled "variation" is the effect upon safety and performance of a brand new mate showing up on board a vessel on which he has little sailing experience. The old way of handling this situation was by the "school of hard knocks, letting the mate learn the ship on his own. The quality management system solution minimizes the potential for negative consequences by providing the mate with a positive, well thought out orientation of the ship and his job. Gilbert's rule used is "no assumptions—no mistakes".

Three major forces can be identified as being associated with global and individual responsibility in the commercial use of ocean space and resources:

- Company leadership in the form of proactive, safety oriented ship owners;
- Training Institutions, which provide effective education and safety training; and
- Competently trained mariners who are highly skilled and safety oriented.

Several International Conventions and industry/governmental programs are related to safety:

- The International Safety Management Code (ISM Code—see Section 3.5 of this book for further discussion) which assures that the safety management system of shipping companies meets international treaty standards.
- The STCW Convention 1995 amendments (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978—see Section 4.2.3 of this book for further discussion) which establishes training requirements for the mariner based upon the level of his/her license, the ship type, and minimum standards of safety;
- The US Coast Guard's Prevention Through People Program (see Section 2.1 of this book for further discussion); and
- Various international partnerships between industry and government, which provide guidance to the training institutions as they teach safety and quality management, and then integrate classroom learning with real life experience.

The goal of each of these treaties and programs is to work together to develop the appropriate tools for proactive safety management, so that maritime commerce is safe and profitable and these natural resources are healthy and viable. Reaching this goal requires change, placing responsibility for safety on the chief executive of a company. This officer needs to know even more than the captain and the crew about whether safety systems are in place, whether self-audits are being conducted, and whether mistakes disclosed are being corrected. This means taking safety data, con-

verting it into understanding of risk, and then acting to implement greater safety. For example, an analysis of fatigue and predictable sleep patterns on ships sailing long hauls might equate to either a change in schedule or adjustments of the watch. The concept that substandard shipping is cheaper to operate must give way to the more correct approach, that, in the long run, it is more profitable for a company to operate within optimum safety conditions (Gilbert, 1997; personal interview, 1999; CML, 1997).

A study conducted by the UK P&I Club (one of the world's largest of the mutual associations providing protection and indemnity insurance to its owner members) bears out the positive impact of safety management systems on high quality operation of ships. The directors established a ship inspection program in 1990 with a team of experienced ships masters who visited over 2000 of the approximately 7000 ships covered by the UK P&I Club at that time. The visits took place worldwide and started with the vessels of companies represented by those on the Board of Directors. Focus was more upon operating procedures and manning, but inspection extended to all aspects of ship operations: cargo worthiness, general maintenance, safety including safe working practices, operational status and pollution control. Five years of data collection from ship inspections (from 1990 through 1994) yielded a report titled "Ship Inspection: A Report to Members". Since this is a mutual association, the stated goal is converting poor quality members into high quality owners.

The report concluded with the following as to safety management and manning concerns: "With the advent of the ISM Code, it appears there is increasing evidence that the structural approach to safety management advocated in the Club and proper manning to flag standards are important contributions to a high quality operation";

- Ship inspections found that 81% of ships visited had a formal, written management policy;
- Where there was non-compliance with manning scales, nine out of ten of these attracted comments, usually adverse, from the inspectors; and
- For those ships without such an active management policy, there were twice as many adverse comments made by ship inspectors (UK P&I Club, 1996).

The findings of this report and the observations about safety management from Mr. Gilbert correlate highly. Leaders of industry are affirming that the application of optimum safety systems works. Benefits flow to the bottom line. Mobil Shipping and Transportation Company (now Sea River Maritime of ExxonMobil) is one of the majors in oil transportation. Mobil Shipping instituted in the early 1990s a safety immersion program which set goals of zero fatalities, zero injuries and zero spills. To this safety initiative was added in 1997, the implementation of Mobil Corporation's Environmental Health and Safety Management System and early compliance with the ISM Code for safety and ISO 9002 for quality service. Supporting and implementing these all inclusive safety and environmental systems produced results for Mobil Shipping. The Lost Time Injury Rate reduced substantially (This is the number of injury

cases for which an employee misses work for a 24-hour period or more per 200,000 man-hours). The system was so effective that Mobil Shipping had a perfect record of zero spills of any amount of oil in 1997.

Charles Huber, former Manager of Environmental Affairs of Mobil Shipping summarizes the philosophy, which produced these results as:

> "Everyone understands that we care about our people, we care about the environment and we also care about the success of our business. As an oil company that owns and operates tankers, we take the possibility of any injury or spill very seriously. A major spill or accident may not only severely damage the environment, but it also may impact the lives of the local citizens and quite frankly, is bad for business. Response, clean-up and remediation costs are expensive. Third party claims, environmental damages and fines escalate these costs even further and go directly to the bottom line. What must also be included in the cost of an incident is the associated cost of business recovery and the even greater costs associated with damage to a company's reputation. This latter cost translates into lost opportunities in the market, which may impact the whole corporation for many years. People around the world want to work with responsible companies with outstanding records" (Huber, personal interview, 1998).

Or as suggested by another Mobil Shipping and Transportation Company executive:

> "It is, however, to the benefit of the many excellent owners who have embraced the safety culture to persuade those who have yet to do so. It should not be too difficult because even the most hard-bitten shipowner who can ignore the benefits to humanity and the environment surely must be persuaded by the long term positive impact on the bottom line" (Fullwood, 1997). (For further discussion of Association and Industry Control, see Section 4.1.1 of this book.)

Peer pressure from those in the chain of responsibility on substandard operators is one of the most important steps taken by industry in embracing the safety culture.

Det Norske Veritas is one of the world's largest classification societies, with more than 5600 employees, offices in more than 100 countries, and responsibilities for classing about 15% of the world's fleet. DNV started a Safety and Environment Protection (SEP) Certification program as a form of safety and quality-assurance assessment (Collins, personal interview, 1999). (For further discussion of Classification Society control, see Section 4.1.3 of this book.) The Safety Management System produced as a result of this program sets optimum standards for the crew's operation of the vessel, for land-based support and management organization, and for the interaction between land and sea operations. Since 1990, the results, for those companies bearing SEP certification have been dramatic:

- 37% reduction in man-days lost due to accidents;
- 40% fall in fines for pollution incidents;

- 10% reduction in insurance premiums;
- 50–90% reduction in damage to cargo;
- Fewer detentions;
- 15–25% reduction in hospital hours; and
- 35–45% reduction in sick-leave (Ullring, 1996, 1996a).

Other benefits which emerged from SEP, although not calculated in mathematical terms, included:

- Increased commitment to safety and environmental protection;
- Improved ethics;
- More predictable shipping;
- Improved credibility with others in industry, leading to such positive results as none of the 95 vessels with SEP certification (per 1997) failing a charterer's vetting inspection; and
- Enhanced personnel retention and motivation.

For four years DNV managed the Norwegian *Green Ships* Programme, for ships which do not pollute the air or sea to a harmful extent and which have built-in protection against harmful discharges in the event of an accident. Ships receiving the Port of Rotterdam's Green Award received the benefit of reduced port fees and had a higher incidence of approval during vetting inspections by charterers. DNV concludes that these types of safety management systems yield cost savings to the shipping industry as a whole, ranging between *$500 million to $1 billion* annually, due to accident reduction. This equates to cost savings to individual companies of approximately $200,000 annually (USCG, 1997; Ullring, 1996a, b, 1997).

For DNV, quality assurance means better shipping: "That doesn't say that there will never be accidents. There will be accidents, but hopefully, we believe, that the frequency will be less, that the severity will be less, and even when they do occur, companies and ships will be better prepared to deal with them and continue to operate the rest of their fleet effectively and efficiently" (Collins, personal interview, 1999).

Have all companies joined in this safety culture? If the statistics tell the truth, the sad answer is "No". Only 5% of the ship owners with safety management systems certified by DNV have received SEP certification (Collins, personal interview, 1999).

The reason is cost and maintaining a level, commercial, playing field:

> "I think that you find some ship owners who say 'I can do this or I'd like to do this to improve safety. I'd like to spend the money, but how long will I be able to operate my ship at a slightly higher rate per day than the fellow next to me who doesn't do anything more than the bare minimum'. There's a paradox here. Everyone in the marine industry claims that they want safety, but a lot of people aren't willing to pay for it due to competitive pressures" (Collins, personal interview, 1999).

The challenge, then, is to prove to the disbelievers that investment in safety pays dividends of greater value and to implement incentive schemes for truly safety conscious companies.

P. Cremers (1996) Executive Chairman of Anglo-Eastern Ship Mgt. Ltd, Hong Kong, speaks from the ship manager's point of view about the overall benefits of quality assurance in shipping. Based on Anglo-Eastern's experience with safety management procedures since 1990, Cremers contrasts the cost of quality with the benefits. His analysis includes investment of these amounts:

- Implementation of a system: $300,000 as start-up costs, with another $250,000 annually to maintain the system;
- $300 per day additional over the costs of "cheap" crew, for a team of 22 qualified professionals;
- Ongoing training of seafarers for an average of $10,000 annually for a bulk carrier to $20,000 per annum for a tanker;
- Investment in training of strong support staff on shore between $30,000 and $50,000 annually; and
- Ship's operating expenses for the impact of quality assurance systems on equipment, communications, audit fees and other costs of about 2.5% of the total budget, or $15,000 to 30,000 per annum.

In comparison, Anglo-Eastern has seen benefits that far outweigh these costs:

- No fatal injuries for four consecutive years;
- 19% reduction in damages to vessel/equipment for the past three years;
- 40% reduction in lost man-hours due to injury;
- 76% decrease in offhire and time lost at sea and in port due to accidents and/or breakdowns;
- 28% company growth in vessels under management in 1996; and
- 10% improvement in employee retention (Cremers, 1996).

Based on the results, Cremers (1996) urges all those in the transportation chain to adopt similar quality management principles, citing positive results for human life, the environment and the bottom line in terms of lives saved, injuries avoided, awareness created, staff motivated, insurance premiums reduced and operating costs reduced. Cremers makes one other unique observation about the incalculable benefits a company derives from a safety management system: "There were and are significant overheads, but the end result has been more than worthwhile as it has allowed us to grow, because the senior management has had more time to focus on policies and planning, as opposed to continuous 'fire-fighting' "(Cremers, 1996).

A recent analysis of return on investment of stock market returns of leading petroleum companies supports the concept that protection of the environment is good for business, not only for short-term return, but also as a predictor for future company viability. In a report titled "The Petroleum Industry: Hidden Risks and Value Poten-

tial for Financiers and Investors", financial advisors developed a tool for measuring "eco-efficiency" of petroleum companies. They defined "eco-efficiency" as "companies' ability to maximize the efficiency with which they create added value while minimizing the use of energy and raw materials inputs, and also minimizing environmental liabilities". Their findings support a growing correlation between a company's "eco-efficiency" and its competitive present and future financial performance. Factors considered included market risk (e.g., consumer boycotts), balance sheet risk (e.g., NRDA claims), operating risk (e.g., costs of spill clean-up), capital cost risks (e.g., pollution control systems), transaction risks (e.g., delay, disruption, staff costs) and eco-efficiency and sustainability risk (e.g., cost and competition).

The report concluded: A "portfolio of eco-efficient companies can be expected to out-perform one comprised of their less efficient competitors by anywhere from 140 to 240 basis points or more per annum. Nowhere are the financial consequences of individual eco-efficiency more dramatic than in the petroleum sector" (Innovest, 1999).

The same cost accounting trends emerge in an entirely different shipping arena (from tankers or blue water operators), in the brown water operators in the United States, the American Waterways Operators (AWO). AWO is an organization that represents 6200 tugboats and towboats and 31,000 barges which transport about 15% of all US freight along the nation's inland and coastal waterways. In 1994, AWO set an industry standard by instituting a Responsible Carrier Program (RCP) which produced a code of standards and optimum practices above and beyond those required by the US Coast Guard or federal law. In April 1998, the RCP became a mandatory condition of membership to AWO. Each member must have a quality assurance program affecting management, equipment inspection, involving the human element in all stages of operation, and a third party audit mechanism (AWO, 1998). (See Section 4.1.1 of this book for further discussion.) The impact on this tug/barge bottom line is significant: membership in AWO has grown. According to Thomas Allegretti, President of AWO, RCP has become synonymous with a recognized quality company:

> "Customers now ask 'Why not?' if a company is not in the RCP program. Barge lines became highly focused on improving their safety performance after passage of OPA 90. They started tracking their own internal performance. These companies could provide you with very meaningful data that would show you, at least with respect to these individual companies, that they have proved that safety pays. Meaning, not only did the money they expend increase the quality of their operations, but it has also increased the efficiency of their operation and has reduced their costs many times over the initial investment" (Allegretti, personal interview, 1999a).

How do the testimonials from executives of companies in all segments of the shipping industry translate to the bottom line? The answer is with a real return on initial investment and ongoing maintenance of a safety management system. ICF Kaiser (USCG,

1997a) summarizes the dollar return to the marine industry of comparable programs over time. The effective return is a reduction over time of the number of incidents that ranges from a decrease of between 30 and 50%. Institution of a comparable program of proactive prevention in accidents yields over time cost annual savings of between *$190.5 million and $317.5 million, or an average yield of $254 million per year* (USCG, 1997a). Safety pays for man, the environment and the increasing viability of the shipping industry.

3.5. Adherence to Laws: ISM Code/Right to Trade

While possession of appropriate certifications under International Conventions (and in US waters as adopted by Congress) is a prerequisite to the right to trade, of these international certifications, one of the newest and most influential is the International Safety Management Code (ISM Code), (IMO Assembly Res. A.741(18)) an amendment to the International Convention for the Safety of Life at Sea (SOLAS) 1974, Chapter IX). The ISM Code is a primary motivator for creating the "safety culture". Today 135 nations, or Member States (parties) have adopted SOLAS, making it applicable to 98% of the world's flag tonnage. The ISM Code became mandatory on 1 July 1998 for Phase 1 vessels: oil tankers, bulk carriers, gas carriers, passenger ships and high-speed cargo ships and high-speed passenger ships of 500 gross tons and above. Phase 2 vessels, all other cargo ships and mobile offshore drilling units of 500 gross tons or more must meet ISM Code requirements by the year 2002.

The goal of the ISM Code is far-reaching. As stated by the International Maritime Organization's (IMO) guidelines, the purpose of the Code is: "... to provide those responsible for the operation of ships with a framework for the proper development, implementation, and assessment of safety and pollution-prevention management in accordance with good practice" (IMO, 1998). Industry views this Code as having the impact of setting a minimum standard for ship management. The ISM Code is a "... powerful engine(s) propelling reluctant operators into the mainstream, as is the ever increasing influence of port state control and the promise of strengthened flag state control". The Port State and Flag State administrations are important players in the implementation process for ISM (Fullwood, 1997).

Two international certificates are required as evidence of compliance with the Code by Chapter IX to SOLAS. The first is the *Document of Compliance* (DOC), issued by the Flag Administration directly or through a recognized organization, such as a classification society. This certifies that the company meets the standards of the Code and is, in effect, the company's license to trade. Every ship of that Company must keep a copy of the DOC on board to be displayed for appropriate Port State inspection. The other important document is the *Safety Management Certificate*, which is evidence that a particular ship meets Code requirements. This must be available as well on board during inspections (IMO, 1998). Without these two documents, Phase I vessels

either cannot operate in certain ports in the world, such as US ports, or they can unload cargo only one time and cannot return to that port again, as in certain ports in Europe. Companies and their ships which do not have ISM Code certification will "come to a sticky end". They will cease to be able to trade in most ports in the world. Insurance and Protection & Indemnity coverage will be void for ships not complying with the ISM Code (Pearson, personal interview, 1999).

While the written Code itself is brief and non-prescriptive, its requirements are revolutionary. Every sector of international shipping is impacted by the three main objectives of the Code:

- "To provide for safe practices in ship operation and a safe working environment;
- To establish safeguards against all identified risks; and
- To continuously improve safety-management skills of personnel, including preparing for emergencies" (IMO, 1997a).

The Company, (the ship owner or any person such as a charterer or manager who has assumed responsibility for operating the ship), must establish a safety-management system (SMS), which complies with the convention regulations and which "takes into account" all IMO or other regulatory bodies' regulations, codes, guidelines and standards. The Safety Management System is set to achieve functional objectives, to be operational and not just a paper chase. The SMS should:

- Create a safety and environmental protection policy, instructions and procedures to ensure safety and environmental protection;
- Clearly define levels of authority, lines of communication between ship and shore support personnel;
- Set reporting procedures for accidents and for responding to emergencies;
- Establish procedures for internal audits and management review; and
- Document all procedures in a Safety Management System manual, a copy of which is to be kept on board the vessel.

Regular checks and internal audits are to be conducted by the company. Non-conformities revealed by audits are to be corrected. The company is to evaluate the SMS periodically to ensure that the system is effective and continuously improves the safety-management skills of its personnel ashore and on board its ships. IMO Resolution A.788 (19) provides guidance for Flag Administrations on the implementation of the ISM Code. IMO Resolution A.848(20) provides implementation guidance for companies (IMO, 1997a).

Responsibility flows from the highest level on land, the Chief Executive Officer of the company, to the designated person ashore, to those in line in management. There is a requirement of knowledge and supervision over past and future operations of the ship. A continuous internal and external auditing process must be in place to assure that the SMS is functioning, with a body of resulting documentation which may

be used to demonstrate conforming or non-conforming safety management systems (Maitland, 1997).

Guy Maitland, an attorney and former executive Vice President of International Registries, Inc. which administers the Liberian and Marshall Island vessel registries, suggests that one of the important operative concepts behind the code is "accountability". Maitland points to Article 4 of the ISM Code in support of his position. It is legally arguable that there is "privity", a direct liability link, between those on board and the owner/operator ashore. Now, because of Article 4 of the Code and the focus on "process", the concept of knowledge and control is expanded throughout the management chain. Article 4 states as follows:

> "To ensure the safe operation of each ship and to provide a link between the company and those on board, every company, as appropriate, should designate a person or persons ashore having direct access to the highest levels of management. The responsibility and authority of the designated person or persons should include monitoring the safety and pollution prevention aspects of the operation of each ship and to ensure that adequate resources and shore-based support are applied, as required".

This section may support the legal doctrine of "responsible corporate officer", which forms the basis for both civil and criminal liability in the event of an oil spill or other accident. (See Sections 4.3.6 and 4.3.7 of this book for further discussion.)

While untested at this time, Maitland contends that the logical extension of Article 4 of the ISM Code is to eliminate the ability of the owner/operator and others in the chain to limit liability based upon the concept of "due diligence". Traditionally, this phrase meant that, if the owner/operator could demonstrate that a ship was sent to sea in a seaworthy condition, as evidenced by certificates issued by the classification society of the operator and/or Flag State, and that reasonable care was exercised in maintenance of the vessel and procurement of competent crew, then that person/entity would be exempt from liability for an incident caused by crew error or other means. It is arguable that Article 4 no longer provides that "out" to the owner. There may now be a continuous duty of awareness and imputed knowledge/privity between the owner and those on the ship and proof in the form of substantial paper information which may connect many parties to an incident should one occur. These persons or entities subject to the privity link may include ship owners/operators, ship registers, vessel agents, charterers, lending/financial institutions, classification societies, Protection and Indemnity clubs and other insurers. The ISM Code may provide the teeth to enforcement, "policing through people's pocketbooks" (Maitland, 1997).

The Code was promulgated in 1996 by the US under 46 USC Section 3201 et seq; 33 C.F.R. Section 96. The Port State authority responsible for its enforcement is the US Coast Guard. This agency has issued a circular, NVIC 4-98 (Navigation & Vessel Inspection Circular) to ensure consistent enforcement guidance on the ISM Code. The US has what it describes as a "zero tolerance" policy. Each Phase 1 vessel

intending to enter US ports must notify the US Coast Guard authorities of ISM Code compliance prior to its arrival in the required Advance Notice of Arrival. Those complying with certification have been entered into the Coast Guard Computer System. If a ship does not have certification, it may not enter US ports. US ships without ISM certification may not sail in international waters and are restricted to domestic trade (Martowski, 1998; Gilmour, 1998). SOLAS and the ISM Code do not apply to domestic trade, except for New Zealand and the Philippines (Pearson, personal communication, 1999).

As part of the Port State control process, Coast Guard inspectors verify that the ship holds a valid Safety Management Certificate and that the procedures of the SMS are properly followed, as part of the routine Port State control program. If "clear grounds" exist, as defined by IMO Annex to Resolution A.742(18), then inspectors will conduct an "expanded" examination. (See Section 4.1.5 of this book for discussion of clear grounds.) The expanded exam will include a review of the SMS manual as well as observation of the crew and ship's ability to meet operational requirements. For example, one area examined will be verification that internal audits have taken place, and a check on the status of the last external audit to make sure, among other matters, that non-conformities have been addressed. Vessels will be detained if a) the required certificates are not on board or b) the expanded examination reveals serious non-conformities with Code implementation. In this event, the US Coast Guard notifies the Flag Administration and the organization issuing the ISM Code certificate. This notification may lead in turn to an external audit of that vessel by the Flag Administration and of even more concern for the company, an audit of the total company safety management system at the company level (Schrinner, 1997).

Of equal importance in motivating companies to comply with the spirit and not just the letter of the ISM Code certification process is the regulatory attitude of those in the chain of responsibility, insurance and associations for the ship owners/operators. The International Group of P&I Clubs (the Group) is composed of 14 Clubs insuring over 450 million tons of owned and time chartered tonnage, or 94% of the world's ocean going shipping. In October 1997, the Group recommended to their respective Clubs that the each P&I Club's Rules should be amended to require valid ISM Code certificates, to deny claims coverage to uncertificated members, and to include ISM Code requirement checks during their routine ship visits and inspections. The UK P&I Club amended its Rule 5 in 1998, making compliance with all statutory and regulatory requirements of the ISM Code a term of insurance and denying any recovery in respect of any claim "... arising during a period when that Owner is not fulfilling or has not fulfilled those conditions" (Martowski, 1998).

BIMCO, the Baltic and International Maritime Council, the world's largest shipping association, adopted a standard ISM clause for voyage and time charters, requiring ISM Code certification for the vessel and her owner and allocating delays, loss and damages arising from non-compliance (Martowski, 1998). INTERTANKO, the largest association of independent tanker owners, representing 50% of the tanker

tonnage afloat, passed a bylaw allowing their Executive Committee to terminate non-complying members, starting in July 1998. Peer pressure creates compliance for INTERTANKO members who wish to avoid the negative reputation caused by being kicked out of this well-regarded and prestigious association (du Moulin, 1998).

In spite of the serious exposure posed to a vessel or its Document of Compliance, failing to have a valid Safety Management Certificate or being found with substantial non-conformities, there is still a questionable percentage of world tonnage still not possessing ISM Code certification. If a Document of Compliance is withdrawn, all associated SMCS are void (Pearson, personal communication, 1999). Additionally, the number of vessels found with deficiencies with the ISM Code or detained by Port State control authorities raises questions about how seriously certain ship owners/operators in the industry are taking the ISM Code requirements and the new safety culture.

ISM Code required document certification as shown by those authorized to issue these is relatively high (for instance, as of the compliance date of 1 July 1998 for Phase I ships):

- **Registries:** Hong Kong—100% of their 116 Phase 1 vessels; Liberia—100%; Panama—85%; Singapore—95%;
- **Classification societies:** Of vessels classed by Nippon Kaiji Kyokai—90%; INTERTANKO—100% (Martowski, 1999); and
- **Classification societies:** IACS—According to the International Association of Classification Societies, as of 31 December 1998, only 83% of the 12,700 Phase I vessels possessed Safety Management Certificates. IMO found that 87% of these vessels had their required documentation in place. The difference in numbers may be due to the more comprehensive filings made with IMO than with IACS, which has a database including information from its membership and a small number of flag administrations (Rodriguez and Hubbard, 1999).

While these numbers seem acceptable on their face, the real test is what Port States are finding when going on board ship:

- **US Coast Guard** detentions (7/1/98 to 9/1/99)—24 foreign flag ships were detained for ISM Code-related deficiencies. 10,289 Phase I vessels were boarded: 18 were bulk carriers, four were oil tankers. Primary problems were key personnel being unfamiliar with the Safety Management System, not performing maintenance, no effective SMS in place, and not following procedures (USCG, 1999);
- **Canadian Department of Transportation** (8/98)—79% of 109 ships inspected were compliant; one had no certification; 13 or 12% were detained for major deficiencies;
- **Australian Maritime Authority** (8/98)—105 of 738 inspected were given deficiency notices and 14 detained for ISM related matters (Martowski, 1999);

- **Paris MOU** (Memorandum of Understanding) results of the Concentrated Inspection Campaign from 7/98 to 9/98: 1517 ships inspected. Eighty-one were detained for non-conformities, for a 5.1% detention rate; three ships were banned for not having ISM certificates. Bulk carriers (8%) were the worst offenders; 58 were detained. Of the classification societies responsible for issuing certificates, the detention rate by class for a minimum number of 10 ISM inspections was above 9% for five such societies with the most often found non-conformities going to the heart of ISM Code certification: no certificates on board, particulars not in order, senior officers unable to identify designated persons or the company responsible for operations, no maintenance records or maintenance not routinely performed, and emergency drills not taking place (Paris MOU, 1998). (See Section 4.1.5 of this book for discussion of Port State control.) As of 1 July 1999, the Paris MOU detained a total of 106 ships, including the vessels identified above; and
- **Tokyo MOU** results of a Concentrated Inspection Campaign from 7/98 to 9/98: 1847 ships boarded, 67 ships detained (USCG, 1999). As of 1 August 1999, Tokyo MOU detained a total of 99 ships, including those detained during the Concentrated Inspection Campaign (USCG, 1999).

ISM compliance, on its face, seems to be working. The Paris MOU concludes that the "... strong stance by the Paris MOU and others has been effective in driving away non-compliant ships" (Paris MOU, 1998). However, the large number of incidents of non-compliance by bulk carriers led to announcement by the Paris MOU of yet another concentrated inspection campaign, concentrated on the structural safety of bulk carriers of more than 30,000 gross tonnes and older than 15 years in 1999 (Paris MOU, 1999).

In the US in 1998, detentions of non-US flag vessels declined significantly, by 32%, from a high of 542 in the prior year to 373 (from a total of 7943 arrivals). This decline is believed to be due, in large part, to the advent of the ISM Code. Of the 24 foreign flag vessels detained in US waters as of 1 September 1999, the Flag States were required to send an auditor from a recognized organization to conduct an external audit of the Safety Management System. Seventeen had acceptable results, seven did not. These seven ships were ordered out of US waters for non-compliance. Four have returned since, undergone an examination to determine their ISM compliance, and have been found in compliance (Pontiff, 1999; Gilmour, 1999; USCG, 1999).

John Ostergaard, Senior Advisor on Marine Pollution of the International Maritime Organization, points to one of the greatest accomplishments of the Code, the identification of a responsible person on land if something goes wrong, and the great opportunity for companies with lower standards to use the Code as a tool to raise their standards (Ostergaard, personal interview, 1999).

Capt. Martin Rowland (Manager, Human Resources, International Marine Transportation Ltd, formerly of Mobil Shipping and Transport Company Ltd, Manager of

Policy, Safety and Environmental Affairs) believes that the ISM Code takes existing, informal systems and puts them into a standard format. This then requires various responsible people in the company to review and approve the system with their signatures on the bottom line and their reputations at stake (Rowland, personal interview, 1998).

Maurice Storey, Chief Executive for the UK Maritime and Coastguard Agency summarizes the novel change of involving senior management in the direct process of reducing spills and accidents:

> "Whereas, previously a ship's safety and pollution prevention capabilities were judged primarily on 'hardware'—its condition and its equipment—the ISM Code concentrates on the human aspects of ship operation, both ashore and afloat, with the objective of minimizing the possibility for poor decisions .... It is the mechanism by which the maritime industry will address the widely held view that senior management, or the 'controlling mind' of an organization, has a significant role to play in reducing the number of accidents" (Golob's, 1998).

Many in industry warn that the ISM Code is not a "quick fix". The initial certification is only the beginning of the movement toward a safety culture. Michael Pearson of the American Bureau of Shipping (ABS), one of the largest classification societies worldwide explains that:

> "We are still educating people that you can't just spend a minimum on safety and then when you get caught out, use money to correct the problem. What industry has not grasped is that if a ship calls at a port and is detained, it may be re-audited, and if we find major non-conformities in the safety management system and the root cause is with the company, then we, as a recognized organization, may recommend to the flag administration that the whole system be audited. This may result in withdrawal of the Document of Compliance and the company may be put out of business" (Pearson, personal interview, 1999).

The process of change will take time. Blaine Collins, the head of Business Area, Maritime North America for Det Norske Veritas, another large classification society, states this sentiment: "

> "We're moving in the right direction, but real change will take time. The idea of the ISM Code is to move towards more systematic processes in maintaining and operating the ship. A lot of these functions now required by the ISM Code will be performed with more regularity, based upon a series of systematic checks and internal reviews and so on. That takes time to implement. At the same time, we need to get better as auditors .... We need to take stock of our practices to ensure that we don't establish an auditing regime that stifles new thoughts, creativity and genuine interest in improving safety. Ship owners will have to change as well as crews on board their ships. Similarly, Flag States and Port

> States will seize this opportunity to change their functions in the international maritime safety system. I think that you are going to see a gradual shift as time goes on. Most importantly, the initial ISM mandatory implementation date for many ships and companies is really the start of a process, just the first step on the path to a true safety culture, a major shift in the maritime community" (Collins, personal interview, 1999).

Because of the newness of the ISM Code and its application to the marine environment, the US Congress in its US Coast Guard Authorization bill, (Section 306, Coast Guard Authorization Act of 1998 (Pub. L. 105-383) mandated a study of the ISM Code, which was conducted by the US Coast Guard. This entity was tasked with investigating several issues. The two primary concerns reviewed were:

- Evaluating the effects of the Code on marine safety and environmental protection; and
- Reporting about whether information developed by companies as a result of their safety management systems should be excluded from use in subsequent litigation or should be available on a limited basis to third parties. (See Section 4.3.8 of this book for discussion of immunity.)

These inquiries reveal how unsettled the implementation of the Code is at the present time.

The regulators, the Flag State and Port State control authorities, will have their work cut out to enforce the new system. The goal is that with cooperation of all involved, substandard ship owners/operators will be forced from the business. Capt. Thomas Gilmour, former Director of Field Activities for the US Coast Guard emphasizes the need for partnership of all players: "The ISM Code is here to stay and we can not let down our guard. We will increase our communication with the MOU's to keep non-compliant ships out of our waters. All involved parties must diligently execute their responsibilities in order for the Code to be a viable tool to eliminate substandard shipping and enhance maritime safety" (Gilmour, 1998).

3.6. The Consumer and the Political System—Public Voice

There is an increasing recognition nationally and internationally that the environmental consumer has a voice, will not stand for pollution of his/her water, and that this voice will be heard and received by elected and appointed officials and regulators. The role the consumer plays is of importance to the maritime industry. Public concern impacts decision makers in a broad arena: in the daily operations of maritime companies, at the governmental and executive levels, in the boardrooms of national and international maritime companies, in the command center during an oil spill clean-up, and in the courtrooms of the world.

One attorney, advising mariners about preventing spills in the first instance, states the obvious:

> "And frankly, from a business standpoint, environmental irresponsibility is not a tag any corporation can afford today. As we close out the millennium, the call for strong central oversight is much louder than the maritime industry has heretofore experienced" (Starr, 1997).

The actions which consumers take after a major oil spill have been of concern for some time to responsible parties because of their direct impact on the corporate bottom line. As an environmental auditor for one of the US majors remarked:

> "From a consumer point of view, we want to avoid a pollution incident before it occurs. If we have such a casualty, not only is the cost to the company significant, *but public opinion is such that people get into the habit of cutting up our credit cards*. We don't like to see that happen. A not-insignificant consideration is criminal sanctions for our chief executive and board members. Our principals are not happy about the idea of going to jail" (Davidson, 1995).

So important is public reaction to an oil spill that many oil companies employ a public relations officer or entire staff specifically to deal with the aftermath of a spill and the news media. Courses teach "how to" manage the new industry with commandments about what to say, how to say it, and when. For example, the Louisiana Oil Spill Coordinator's Office in Baton Rouge, Louisiana, responsible for oil spill response throughout the state, cautions industry in one of its oil spill response training courses as follows:

Public affairs—principles

- New releases and other public information should be coordinated to prevent conflicting release.
- The media should be treated fairly and honestly as professionals who have an important job.
- Information presented should be correct and phrased in non-technical terms for easy understanding by the general public, including numbers and units of measure.
- It is better to be proactive in presenting the story and keeping interested parties informed than to wait for requests for information.
- All communications with the media (are) "on the record" (and the mike is always ON).
- Information should be positive, never negative or evasive (LOSCO, 1998).

This fear about public opinion is well founded. The consumer and average citizen care about oil spills. As a result of major worldwide concern, 1997 was designated the International Year of the Reef and 1998, the International Year of the Oceans. Many

groups organized worldwide to address the issues raised about the oceans during these two years. SeaWeb, a Washington, DC based project of The Pew Charitable Trusts was created to raise awareness of the world's oceans and the life within, primarily through collecting and communicating information about the importance of the oceans to decision makers across the United States. According to surveys conducted by a research group employed by SeaWeb, the overwhelming majority of Americans believe that:

- Oceans are important to them personally—(80%);
- Oceans are in trouble, due to a worsening environmental condition—(60%);
- Their destruction threatens the quality of life—(85%);
- This destruction will occur in a serious way in a decade—(two-thirds);
- Oil spills are the most serious threat—(81%); and
- One of the prime culprits are the oil companies, who not only pose the most serious threat, but also are seen as most able to positively affect the ocean (Mellman Group, 1996, 1997).

Scientists have joined the citizen in voicing their interest and consideration for the impact of pollution on the waters surrounding humankind. In a dramatic move, over 1600 scientists and conservation biologists from 65 nations urged action on the part of all countries to preserve our oceans in a statement entitled "Troubled Waters: A Call for Action", issued as a result of the First Symposium on Marine Conservation Biology, in June 1997. The actions requested included among others, minimizing pollution discharged at sea (MCBI, 1997).

After hearing the scientists and reports on the state of US waters at the National Oceans Conference in Monterey, California, in June, 1998, President Clinton of the US signed several Executive Orders. One was for Coral Reef Protection, with wide-ranging consequences for the oil industry. This order created a Coral Reef Task Force to implement overall policy and coordinate with Federal agencies, with a goal of among others, of reducing impacts from pollution. The second extended an existing moratorium banning offshore oil exploration and production on the US Outer Continental Shelf until June 2012. This Executive Order banned indefinitely oil exploration in national Marine Sanctuaries (Executive Order, 1998; Golob's, 1998a).

Environmental and human rights organizations protested outside the headquarters of the Royal Dutch Petroleum Co, Shell Transport and Trading PLC and Texaco's, annual meetings, urging increased environmental standards, clean-up of past oil pollution, and increased aid to local communities where companies conduct oil exploration and production (Golob's, 1997). At the International Oil Spill Conference in Seattle, Washington in March 1999, 10 years after the *Exxon Valdez* oil spill of 24 March 1989, protestors stood outside the conference halls daily objecting to many environmentally sensitive issues. Among these was the proposed merger of Exxon Corp. and Mobil Corporation (since merged as ExxonMobil). Eleven associations joined with citizens in presenting a petition urging Federal and State officials of Alaska to lead Congressional opposition to the proposed merger. Grounds cited were many, but

they included the failure of Exxon to be publicly accountable: "Exxon Corporation's irresponsibility is evident in its inability to prove itself to be environmentally and socially accountable".

Under the Oceans Act of 2000, a US commission has been established to conduct a comprehensive review of US ocean and coastal policies, to result in a National Oceans Report. Protection of the marine environment is to be a key factor in this policy review (OSIR, 2001)

The public are not the only outsiders who voice concern. Stakeholder interest in companies is now so significant that environmental reporting is becoming a part of annual reports:

> "We have seen the growth of environmental reporting develop from virtually a zero base in 1990 to the point today where approximately 50% of all listed companies in the UK make reference to environmental issues in their annual reports. It is clear that those who were dismissive of green issues in the 1980s can no longer afford that attitude" (Ullring, 1996).

An issue paper (Perry, 1999) presented at the 1999 International Oil Spill Conference raised the question whether improved performance by industry in response had a positive effect on "political, media, environmental and public perception of oil spills". The answer, according to the author, was a resounding "No". In Perry's paper the argument is for long-term educational programs to change public attitudes and perceptions, without which the author questions how much the oil industry can advance toward public acceptance. Perry speaks to the common misperceptions nursed by public citizens:

> "Such programmes will be difficult to implement, given the public's general misperception and deep-rooted suspicion of both government and industry. The pubic reluctantly accepts that the price of the automobile culture is congestion, air pollution and road casualties but does not accept that this price also includes large-scale oil transport at sea with inevitable tanker accidents, however rarely they occur. The public also does not understand that the proportion of oil spilled to oil carried is minute, and seafarers are human and, therefore, prone to error" (Perry, 1999).

The study promises some hope for a better relationship and trust between industry and regulators, but limits this hope as to the public at large. The conclusion is that without better education of the public, "... the expectations of what can be achieved in an oil spill cleanup will remain unrealistically high, and no response will be perceived as successful" (Perry, 1999).

There are others in industry and on the regulatory side who do not share the issue paper's view in total. Richard du Moulin, former Chairman of INTERTANKO, the association representing independent tanker owner/operators in the world, speaks positively about the changing image of his members. INTERTANKO started a campaign

not only to improve the public's perception of owners at the time of an incident, but also to improve the reality justifying a more positive attitude. Viewing the incident as the time when the public focuses most attention (usually negative) upon the shipping business, INTERTANKO began media training for its senior company executives on how to communicate and feel comfortable with media. The positive side effect of such training was that good communication between executives and others during a crisis spills over into better communication during daily operations. Dealing with media became an internal way of getting the right message to members.

Although 99.997% of oil shipped arrives safely to port, it is the other less than 0.1% that the public sees. INTERTANKO decided to turn its attention toward the target goal of 100% safe arrival with emphasis placed on the quality of its membership and communicating this to the public. (See Section 4.1.1 of this book for further discussion.) By shifting emphasis in publicity to the 100% figure in an attempt to win back public approval for the oil shipping industry, INTERTANKO impacted its membership, again, through solid action as to self-regulation, peer pressure on substandard operators, and increased quality of operations. The message to the public echoes that to the members of the association:

> "If the Chain of Responsibility—comprising all parties bearing some responsibility for safe tanker shipping—is to function effectively, each participant must get their own house in order and communicate their efforts as a first step" (du Moulin, personal interview, 1999; INTERTANKO, 1997).

Thomas Moore, President of Chevron Shipping Company supports a media focus, but takes a different look at what is needed and the message to be communicated to the public. His pitch is that understanding of shipping is not just about oil, but runs deeper. Oil means energy and energy affects our quality of life. Oil is a component in every part of our life, from the light switch which turns on, to the planes which carry us across the globe, to every part of each business which uses energy. Oil is a critical commodity for how we live and must get from the source, West Africa, the Middle East, the North Sea, to us as the consumers. Tankers carry about 50% of all oil produced to the user worldwide. They are the vessels that enable us to experience our quality of life. What Mr. Moore seeks to create is a better understanding of this basic role of tankers and their performance in carrying out their goal.

A spill by Chevron Shipping of two barrels of oil, compared to the volume actually transported of 589 million barrels is a performance ratio comparable to 200% better than what the average citizen does each day, when he or she "tops off" the average twenty gallon car gasoline tank and spills oil on the gas station blacktop. To the good ship operator/oil company, nothing is more important than making sure that not one drop of oil is spilled, that the tank is not overfilled. Moore does conclude with a "drop" of pessimism. The oil industry is a victim of its own success. The public is so conditioned to expect success, i.e., that oil will be available instantly, that, if anything



On Wednesday, 5 November 1997, a Medium oil spill occurred when the Motor Vessel *Kure* backed into a piling at the Louisana Pacific Lumber dock in Samoa, California in Humboldt Bay and damaged a fuel tank resulting in the release of 16,000 gallons of Bunker C fuel. Photograph courtesy of NOAA Office of Response and Restoration.

does go wrong, the price increases, a spill occurs, and the public immediately focuses negative attention upon the industry (Moore, personal interview, 1999).

Capt. Harlan Henderson, former Commanding Officer of the Marine Safety Office of the US Coast Guard, San Francisco Bay, CA points to fair dealing and open communications as the reasons for success in dealing with the media and concerned citizens during spills of national significance. Within hours after the *M/V Kure* spill in ecologically sensitive Humboldt Bay, California, Henderson issued press releases, walked the docks with fishermen to get their concerns, and continued to conduct briefings with concerned citizens and members of the press about the status of the response. He identified where the areas of concentration were, how birds and other resources were being cleaned, and listened to feedback from all involved. He relates the results. People came up to him during and after the spill, shook his hand and thanked him for doing a good job (Henderson, personal interview, 1999).

Henderson's experience was a far cry from how *Exxon Valdez* conducted itself during that spill. "The company's public relations performance at the time of the disaster was dismal. Mr. Larry Rawl, the then Chairman, declined to visit the site saying that it would make no difference to the cleanup operation. That led to scathing treatment in the press, to the extent that the *Exxon Valdez* incident is used by other oil

companies as an example of how not to deal with the media in the aftermath of oil spills" (Perry, 1999).

Regardless of what tactic the shipping industry takes to deal with the public and media, the fact is that citizens in the US and increasingly, the population worldwide, demand environmental stewardship. The companies which adopt the safety culture, regulate themselves, and match action to image are those which will be in business in the future. DNV makes this point eloquently:

> "The environment concerns us all. It is not a free commodity, but an asset we should treat with precaution like any other asset important to our business. . . We have a lot of the knowledge and tools to reduce the environmental impact while still providing prosperity to more people .... We should gain public acceptance of shipping as an environmentally friendly mode of transportation and maintain this position .... Shipping cannot evade its part in a development that meets global needs today without compromising the needs and aspiration of future generations. I am convinced that tomorrow's winners are those who show environmental stewardship today" (Ullring, 1996).

Those in the business of environmental advocacy believe strongly in the power of public concern to shape change. In the US, public impact is seen through the political process and the pressure Congress can bring to bear on the regulators, such as the US Coast Guard, and through the watchdog activities of well-funded and staffed public interest groups like the Prince William Sound RCAC, the citizen advisory group in Alaska. Sally Lentz, Director for Ocean Advocates, sees industry as having taken a step in the right direction, i.e., they are talking the right talk. What she questions is whether the intent exists behind the words. As an example, Ms. Lentz points to the recent activity by INTERTANKO in Maine to stop passage of legislation affecting shipping, much like that of the State of Washington, which legislation INTERTANKO challenged in a law suit, reviewed by the US Supreme Court and overturned. (See Section 4.3.1 of this book for further discussion.) Good ship owners are paving the way for clearing out substandard operators. Lentz believes that the US is ahead of the international community in this regard. However, as long as those poor quality shippers are operating, the potential for a major disaster exists.

What Lentz supports is even greater public involvement of citizen advisory boards, created, funded and staffed in the major coastal states subject to the greatest oil spill impacts. One source of funding for these "watchdogs" could be from the Oil Spill Liability Trust Fund. (See Section 4.3.5 of this book for further discussion.) RCAC has contributed to the Alaskan shipping lanes being some of the safest in the world. Other advisory groups could have the same type of effective input. The public cares about the oceans. The public needs more, not less support to advocate environmentally safe shipping (Lentz, personal interview, 1999).

The courtroom bears not so mute testimony to the power of the public voice. The former US Assistant Attorney General for Environment and Natural Resources, Lois

J. Schiffer, expressed this message loudly and clearly in speaking of the first Royal Caribbean Cruise Line plea agreement, in which that company pled guilty to a series of environmental violations and was fined $9 million totally: "Our oceans are not a dumping ground for polluters .... This plea agreement shows that we will vigorously enforce the laws designed to protect our oceans and criminally prosecute those, such as Royal Caribbean, who break them" (USDOJ, 1998). In a more recent plea bargain, Royal Caribbean Cruise Line pled to an additional $18 million criminal fine for yet more egregious pollution conduct (USDOJ, 1999). The consumer is a powerful motivator for prevention and best response.

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Chapter 4

Legislation and Regulation

The question for the industry in this century is what choice will the ship owners and operators make or will the regulators and legislators make it for them? Will they evade the new international standards and civil and criminal liability risk and simply comply by doing only what is expected of them, or embrace the "safety culture"?

One of the important challenges for the maritime industry is whether shipping companies will adopt the concept that the "safety culture", which includes protection of the environment, is "good business". What this policy shift requires is the adoption by ship owners of the International Safety Management Code (ISM Code), reliance upon quality of management in all aspects of ship operation, infusion of money into maintenance, upgrading of ship systems, training qualified individuals, and the employment of professionals, not "cheap crews".

Oil spills result in tangible direct loss of life, injuries, damage to the environment, cargo and vessel. Direct costs measure only part of the total. External costs (indirect and hidden) are harder to quantify. They include, for example, reduced worker morale and productivity, eroding customer base, and in this litigious age, natural resource damage assessment, economic loss claims, increased insurance costs, fines, imprisonment of CEOs and loss to the corporation for their services, public notoriety, lost opportunity, and many other similar losses.

In other words, money spent in the front end saves mega dollars spent later. The *Morris J. Berman* spill in 1994 is a good example. A $9000 towline replacement would have avoided an $87 million dollar oil spill off Puerto Rico, and the $75 million dollar fine levied against the subsidiaries and parent company involved (Ornitz, 1996). Oil spills result in tangible direct loss of life, injuries, damage to the environment, cargo and vessel, loss of time, loss of consumer base and many indirect costs. Perhaps most significantly, a spill can mean loss of freedom due to criminal imprisonment.

The goal of the maritime industry should be to develop a safety mentality in all those engaged in shipping oil. Each member of the safety net surrounding the vessel must be involved in the implementation and enforcement of appropriate rules and standards devised to prevent oil spills and respond to them appropriately. The current more passive inspection culture relies upon regulatory inspections to find the "problems", fix the symptoms without determining what the true root causes are, and reacts with suspicion and disbelief toward regulators. The regulators in turn depend heavily

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The *Morris J. Berman* tank barge on a two-day voyage to St. John, Antigua, pulled by the tugboat *Emily S.* broke an improperly repaired towline and ran aground on a reef off San Juan, Puerto Rico, spilling 798,000 gallons of No. 6 diesel fuel. See Ornitz (1996) for a review of this spill. Photograph courtesy of NOAA Office of Response and Restoration.

on the traditional system of primarily technical compliance, through inspection. The safety culture is a continuous learning process, incorporating lessons learned, proactive activity that address root causes, and an appreciation and understanding of the value of responsible management. The importance of the safety net as it functions within the safety culture is that the substandard operator will be out of the trade and the sustainable company will operate a healthy, self-regulating, quality awareness of shipping worldwide (Voogel, personal interview, 1999).

This section discusses the important US and international regulatory framework that serves as the legal motivation for support for the safety culture by all members of the chain of responsibility for the oil spill industry.

The emerging legal theme for the year 2000 and beyond is "environmental crimes". Oil spills have become serious business in the US and internationally and equate to real costs for companies sued for oil pollution. Management at the top is becoming the target of criminal investigation. Responsibility for spills affects not only the lowliest mate. Liability touches the Chief Executive Officers of the Responsible Party company, subjecting individuals at all levels to potential imprisonment and large fines. The *Morris J. Berman* oil spill in San Juan, Puerto Rico of almost 798,000 gallons of No. 6 diesel fuel resulted in the largest criminal environmental fine in US history, $75 million, the seizure of some $19.5 million in assets of the three individual companies

involved and also of the parent company, and house arrest of the managing agent. The agent's sentence was later overturned on evidentiary grounds, but the legal doctrines affecting the liability and assets of the corporations remain settled law.

Aggressive litigation on the part of the US Department of Justice (USDOJ) and individual state environmental crimes departments has led to numerous actions, fines and sentences. Examples are: the *North Cape spill* in Rhode Island on 18 January 1996, with its resulting $7 million dollar criminal fine against three companies, additional $1.5 million payment to purchase ecologically sensitive land, $1 million to upgrade safety on ships, $20 million in clean-up costs, and probation for the company president of Eklof Marine and Master of the *Skandia*; the *Royal Caribbean Cruise Line* (RCCL) case with its $8 million criminal fine for the Puerto Rico Case the $1 million criminal fine for the Miami, Florida case; the fine of $18 million for more statutory violations against RCCL (OSIR, 1999b); and the latest case against RCCL for pollution activities in Alaska leading to a $3.5 million settlement (OSIR, 2000).

Internationally, various courts have entered a series of fines and imprisonments for environmental offenders, even including criminal proceedings against senior harbor managers and the port authority of Milford Haven for the 1996 *Sea Empress* grounding in Wales around the Milford Haven port and subsequent 21 million gallon crude oil spill. The Port Authority was fined $8 million (OSIR, 1999a). This fine was reduced at a later date to $1.8 million (OSIR, 2000a).

4.1. The Safety Nets

The players (see below) in the business of shipping can be viewed as interrelated parts in a greater whole. Their objective is to protect the safety of their mariners, prevent pollution of the environment and make money while moving oil and other products around the world. These partners include every facet of shipping. Their interrelationship has been characterized by a series of safety nets surrounding the vessel. In concentric rings, flowing from the innermost to the outermost circle are those responsible for safe tanker shipping:

- Owners and operators;
- Flag States;
- Protection & Indemnity Clubs (P&I Clubs), insurers;
- Classification Societies; and
- Port States (Voogel, personal communication, 1999).

Two types of shipping states control ship owners and their vessels, the *Flag State* and the *Port State*. The Flag State is the country in which the vessel flying its flag is registered and whose issued licenses and certifications mean that the vessel meets applicable provisions of international conventions and national regulations. The Port State is the country whose port receives the vessel. Port States offer the last "safety net" in this web. "When shipowners, classification societies, insurers, Flag State ad-

ministrators have in one way or the other failed to do their job, Port State control comes into the scene. In an ideal world, port State control would not exist but unfortunately, due to inescapable realities, port State control must remain a standard feature in the maritime safety field" (Plaza, 1997).

The International Maritime Organization (IMO) is the world organization tasked by the United Nations with dealing with the shipping industry, in the principle areas of safer shipping and marine pollution control. The organization's slogan is "Safer Shipping and Cleaner Oceans" (IMO, 1998b). IMO emphasizes that each interest in the safety net must be involved in the implementation and enforcement of appropriate international rules and standards in order to eradicate substandard ships and prevent accidents. "It is the joint responsibility of administrations, shipowners, classification societies and all those involved in the day-to-day operations of ships to see that ships conform to the internationally agreed standards, that they are well run, well maintained and do not pollute the marine environment . . . " (IMO, 1997c).

The ship owner/operator organizations are among the more influential members in the system are INTERTANKO, the largest organization representing independent tanker' owners and operators worldwide, describes these safety nets as consisting of three "Chains":

- The Responsibility Chain;
- The Quality Chain; and
- The Image Chain, and likens all players to the "links" forming each chain.

The *Responsibility Chain* is the most comprehensive of the three chains and places responsibility for the highest standard upon all links to uphold the principles of safe transport, cleaner seas and free competition. Those concerned are ship owners/operators in the form of cargo owners, charterers, ship owners, class societies, salvage industry, flag administrations/governments, port authorities with their associated terminals and pilots, the insurance industry of P&I Clubs, cargo and hull underwriters, and the court system. Each is closely connected with the other. The first step in this endeavor is that each participant must get its own house in order (INTERTANKO, 1997).

Among this larger set is a second group of the shipping community occupied with mutually reinforcing the means to improve the standards of tanker operation and safety. This chain is labeled the *Quality Chain*. These players are responsible for implementation of stricter controls of the international treaties, including the ISM Code and national regulations. They include IMO as the main regulator at the center of the chain. IMO sets the standards. Flag States enforce them (or not). The links are forged by systems that each institutes: Owner safety management systems, Charter Company vetting, Class enhanced surveys, Flag State control, Port State control, Terminals check lists. Each influences the other through these activities. For example, "Flag State performance will improve as port states implement selective targeting of the less safety-minded flag states".



By Scott Willis, *San Jose Mercury News*, July 13, 1989.

The final chain brings the public into the concept of safety nets, through what INTERTANKO calls the *Image Chain* (INTERTANKO, 1997). This chain deals with creating and operating channels of communication about the complexity and magnitude of the problems associated with shipping of oil and response when an incident occurs. Those in this chain include politicians, regulators, environmental organizations, the media and the public. The goal of the Image Chain is to improve relationships through better cooperation between all sectors. This means better environmentalist contacts, more participation of regulators who make the laws, increased oil company communication through media response training, and involvement by industry in political lobbying to close important gaps in the regulatory regime. When the safety nets are functioning, the Image Chain helps to improve the public's view of the shipping industry. Then, those in the Responsibility Chain are seen as competent and serious, and industry is regarded as a well managed service industry (INTERTANKO, 1997).

Accidents are complex in their nature, need greater understanding of all members in the chain, and fuller participation by all parties involved to appreciate the causes and then take part in the solutions. As an example of how this chain works, today,

when tanker accidents occur, the public focuses on the ship owner as the guilty party. In fact, many others in the chain of responsibility may be at fault. A fuller understanding of the variables leading to an incident may result in a more comprehensive solution to the real causes behind the oil spill (INTERTANKO, 1997).

What is the ultimate importance of the safety net, with its responsible party links composing these various subsets of chains? The goal is that the substandard operators will be out of the trade and that those remaining will operate a healthy, self-regulating, quality business of shipping worldwide (Voogel, personal interview, 1999).

The Commission of the European Communities has eloquently summarized the call for a safety culture in its recent Communication to the Parliament. After analyzing the weak links in these chains, the Commission poses this challenge to the tanker industry: "What is needed all-in-all is a package of measures which will bring about a change in the culture of the tanker industry. There should be stronger incentives for quality minded carriers, charterers, classification societies and other key bodies. At the same time, the net should be tightened around those who seek short-term personal economic gain at the expense of safety and the marine environment" (Commission of the European Communities, 2000).

4.1.1. Ship Owners/Operators and Their Associations

Operational safety is the responsibility of the ship owners and operators (IMO, 1997d). Although Governments have most responsibility for implementing standards because they ratify the conventions concerned, it is the ship owners and managers who are in the best position to ensure that standards are high" (IMO, 1997d). According to various statistics, tanker safety has improved significantly in the last five years in terms of oil spills, time lost due to groundings, fire, explosion and structural damage. (For further discussion see Chapter 1 of this book.) "This safety improvement did not happen by luck but was the result of a concerted effort by many segments of the tanker industry" (INTERTANKO, 1997). The ship owner, charterer, oil companies, managers they each employ, and the associations representing the major oil companies and the independent tankers, towboats and tugs compromise an important segment of the safety chain. They form the first layer of the safety net around a vessel.

For the ship owner in the business of transporting oil, full commitment to safety is becoming the only recognized and acceptable standard of operations. In the long run, cost cutting means more loss than savings (INTERTANKO, 1997). Public pressure is greatest on oil tankers because of their high visibility and the volume and impact of their spills. Commercial benefits are to be gained not only from good operating practices, but also from the public respect garnered from safe operations. What is lacking and sorely needed, from the ship owner's point of view, is more uniform enforcement of the regulatory regime, not more regulation. If the substandard operator is to be driven out of the trading arena, there must be a "level playing field", with rules applied evenly (INTERTANKO, 1997).

For the charterer, who is the end user and purchaser of maritime transportation, given the aging world fleet, the primary responsibility is to balance quality, price, and risk (following the 1999 *Erika* oil spill) when selecting a ship. Part of the blame for the *Erika* spill is being placed upon the failure of the Classification Societies to maintain their standards of inspection and the practice of vessel owners jumping from class society to class society as their vessels age. Vessels used should be classed by a recognized classification society, not routinely targeted by Port States (for inspections), suitable for their intended destinations, manned by qualified mariners, and operated in compliance with international conventions and national laws. As a result of the *Erika*, the European Commission has proposed several changes for rule amendments for classification societies, as has the International Association of Classification Societies (Rutherford, 2001). Whether a company charters vessels or, like the major oil companies, (such as Chevron Shipping Company or ExxonMobil), owns a significant fleet and charters the rest, the company has a fundamental responsibility to provide safe transportation. Use of inhouse vetting of ships, reference to database tools provided by the industry, and participation in industry forums increases the prospect that the cargo will arrive safely. Since the oil company facility is usually the point of beginning and end for all trips, cargo owners have another obligation. That is to maintain and operate safe facilities.

The ship or vessel owner associations acting on behalf of ship owners have an equally important role in promoting safe transportation of oil by their members. The International Association of Independent Tanker Owners, INTERTANKO, is an industry association, representing 75% of the independent tanker tonnage not owned by oil companies, nor by the government. Their representation includes over 50% of the total tanker tonnage in the world, some 2016 tankers. Starting over 10 years ago, INTERTANKO began an active program of targeting safety, with the goal being that 100% of its members' oil cargo would reach its destination safely. INTERTANKO coined a much used campaign phrase, "the Age of Intolerance" (INTERTANKO, 1997).

> "The Association as a whole and its members individually have become intolerant of substandard practices, both amongst fellow ship operators and in related sectors of the industry. *To match the public's zero tolerance of tanker pollution, INTERTANKO has set the industry a goal of zero accidents*. We have established membership criteria that we have rigorously enforced and will continue to apply rigidly in the future. We are intolerant of those who do not comply, whether they are prospective members of INTERTANKO, current members about to be ejected or operators of other types of vessels".

INTERTANKO enforces this concept by its rules for membership, which require:

- That every ship of a member's fleet be classed by a classification society belonging to the International Association of Classification Societies (see Section 4.1.3 of this book).

- That every ship owner be a member in good standing of a recognized Protection & Indemnity Club (see Section 4.1.4 of this book).
- That each ship of the fleet carries a valid International Safety Management Certificate and that an active management system be in place and maintained. INTERTANKO's members have reached 100% compliance with the ISM Code (INTERTANKO, 1997).

INTERTANKO maintains a Fleet List for each of the ships owned by its members, identifying the classification society, the Flag State, the P&I Club, and the ISM Code certification status. Staff members determine compliance with the Rules in each area for each ship. INTERTANKO has found that their membership requirements are an "amazing hammer". Peer pressure makes being included of utmost importance and being ejected from the organization an unacceptable situation for ship owners. Since starting their proactive safety program, INTERTANKO's membership has increased by 200 members. INTERTANKO uses three regional panels to accomplish its ambitious work of being the "leading link" in the Chain of Responsibility (INTERTANKO, 1997; du Moulin, personal interview, 1999).

The ship owner who follows this policy of "getting its own house in order" realizes bottom line results. According to Richard du Moulin, past Chairman of INTERTANKO and President of his own shipping company, Marine Transport Corporation, fleet incidents in his company have decreased in just two to three years from 58 incidents annually to 12 a year. An incident is defined as any breakdown or event costing more than $25,000 or six hours, or any pollution, grounding, collision, or injury, or any loss time for an employee due to an accident of more than six hours (du Moulin, personal interview, 1999).

The world's largest shipping association, The Baltic International Maritime Council, (BIMCO) uses information age tools to accomplish its goals of creating the safety culture for its members. BIMCO represents more than 2650 ship owners, ship brokers, agents, P&I Clubs from 110 countries, which control more than 55% of the world merchant fleet. The secretariat for BIMCO is in Denmark. BIMCO has extensive databases for its members, which touch upon almost every aspect of shipping, through its Web sites, publications, bulletins, and shipping manuals. While actively engaging in the development of regulations through consultative status in IMO, what BIMCO most encourages for future industry attention is worldwide, uniform application and enforcement of the regulatory regime already in existence (BIMCO, 1998).

BIMCO is a forum for its members to air views about the most pressing issues in the business and for them to receive information from others involved in the chain. For example, BIMCO has formed several working partnerships with the US Coast Guard, with ongoing initiatives addressing the challenges for the millennium, like the question of ballast water exchange, introduction of non-indigenous species into new marine environments, and others. In the recent past, there has been an active exchange of information from the US National Oceanic and Atmospheric Administra-

tion (NOAA) representatives about natural resource damage assessment, particularly about the move to include restoration "endpoints" in the most initial stages of any clean-up. (For further discussion of reducing environmental damage, see Section 3.2 of this book.) During the last two years, BIMCO has concentrated its efforts upon improving the quality of its members and getting rid of or upgrading the performance of substandard operators through a series of educational courses held worldwide. These courses have educated ship owners about regulatory changes in OPA 90, STCW 95, the ISM Code, what these treaties or laws require of ship owners, how they can best achieve compliance and what the goals of quality should be.

BIMCO can apply considerable peer pressure on its members who are not meeting the high standards of the association. The link deserving the most attention in this next decade is the charterer. Charterers must not charter ships to substandard operators. When charterers award contracts to the lowest bidder, who does not necessarily have a quality operation, they place the quality operator at a commercial disadvantage. Even the big companies who speak of careful vetting have more work to do. Their policy of quality may not be filtering down to the people who initiate the charters (Kime, personal interview, 1999).

The Commission of the European Communities echoes Admiral Kime's concerns. In a March 2000 Communication, the Commission points to the increasing trend of the competitive charter market, where finding the cheapest charter, not necessarily the safest one, is "an essential part of the business". Short-term charters are replacing long-term contracts. The result is that there seems to be little reward economically for the quality charterers, companies with good reputations. Rather, use seems more focused on small, low-cost operators (Commission of The European Communities, 2000).

American Waterways Operators (AWO) is the "brown water" peer to the "blue water" deep draft associations like INTERTANKO and BIMCO. AWO is a national trade association that represents the owners and operators of tugboats, towboats and barges transporting cargo on the rivers and inland waters and the coastal commerce of the US. AWO has 375 members and has been in existence since 1944. AWO regards its members as having an affirmative duty to be leaders in marine safety. The association believes that industry and not regulatory government, has the necessary understanding to implement practical, reasonable and meaningful standards in terms of reducing accidents and fatalities. With this leadership goal and self-regulatory approach in mind, in 1994, AWO started the Responsible Carrier Program (RCP), which has become a model for the industry.

Initially begun on a voluntary basis, this code of standards and practices for all aspects of tug/tow shipping, became a mandatory condition for membership in AWO as of April 1998. AWO uses a national network of more than 70 auditors who conduct third party audits of its members to determine operational compliance with the RCP. These auditors are themselves qualified through an internal AWO process. RCP is a complementary program to the International Safety Management Code. Both codes

focus upon management commitment and the use of documented policies and procedures to ensure safe vessel operation. AWO's membership roster is limited to those companies who, through their compliance with the RCP, demonstrate a commitment to invest in safe management practices and policies.

The results have been dramatic. Peer pressure comes in to play. Repeat customers form the basis of the profitable tug business. These clients now ask if a company is part of the RCP, and if not, why not. Instead of losing membership, as AWO at first feared because of the mandatory RCP requirement, their membership base has increased significantly since its inception. Members report better efficiency of operations with resultant reduction in costs due to less incidents. AWO believes its best industry practice, as symbolized by its RCP, will go far in creating a safety culture even in an independent culture like the "brown water" trade (Allegretti, personal interview, 1999; AWO, 1998a, b).

Chevron Shipping Company (Chevron Shipping) is in a unique position to produce a safety culture in all aspects of its marine transportation services. Chevron Shipping's primary responsibility is to provide marine transportation services to the Chevron group of companies. Through an integrated system, Chevron Shipping has control over all marine functions, whether through its own vessels or those chartered by it in a fleet that trades worldwide.

The Chevron Shipping fleet consists of 60 oil tankers, 35 of which are owned by Chevron, and the rest of which are chartered after "serious" inhouse vetting by Chevron (Moore, 1999). Chevron Shipping is the support transportation arm for the oil and gas business of its parent company. In this role, the primary driver for Chevron Shipping is "downside protection", delivering services safely, on time, and without negative impact to the financial bottom line. Accidents detract from the bottom line. "Avoiding incidents is a top priority" in everything that Chevron Shipping does (Moore, 1999).

Developing the safety culture in protecting people and the environment is a way of life for Chevron Shipping. The implementation strategy that Chevron Shipping has utilized to do this over a number of years can serve as an example for the industry. The approach is:

- Leadership at all levels. The President of Chevron Shipping has applied a total "hands on" management and by his example, requires all others in the management chain to be personally responsible for their actions and accessible to all employees of the company;
- "Success sharing" means reinforcing the concept that safety pays. Chevron Shipping monetizes safety, by compensating its employees in the form of a performance dividend of up to 4% for meeting safety driven targets and maintaining an incident free operation. Reference is made to OSHA criteria to establish acceptable levels of personal injury incidents. Oil spills refer to any oil released to the water, which has a visible sheen. The real impact of this program is to

personalize the strength of the safety culture, to bring its value into the individual consciousness of every employee;

- Risk management takes place at every level of company activity and involves making prudent decisions based on assessment, prevention, and control;
- High-end education of senior officers, such as requiring captains to do simulator training and ship handling training, creates better-qualified management. Integration of the team concept is a part of the management system in every ship. The "Total Quality Management" concept applies to all ship operations. Its goal is to create multiple layers of defense and to engage people in the idea of accountability. For example, team based training is used for the bridge. For every voyage, the bridge team has a goal of a successful voyage, a voyage plan to promote that goal, and a working inter phase between the pilot and the team to reach the goal. Each ship has its vessel management team of two masters, two chief engineers, and shoreside mentors to promote the quality of management;
- Development of a set of operating manuals for ISM Code compliance, with an organized tier system of policies, manifestations of the policies, and reference material. When conditions are detected, that are inconsistent with the regulations, they are to be responded to within a short time and the manuals reviewed to see if relevant sections function as anticipated; and
- The Safety Bulletin is a magazine produced monthly by Chevron Shipping, whose aim is to share experience and information and promote safety. The Safety Bulletin acts as an inhouse communication tool (Moore, personal interview, 1999).

What these and other programs equal is a strong contrast between good operators and what Moore calls "rogue" operators. Chevron Shipping reaps the benefit of their controlled system: they use their own ships which are manned by Chevron officers, carrying Chevron cargo, calling at Chevron facilities, and bearing the hallmark of Chevron on the stack. They also use third party ships that have been inspected to insure that the operator has a commitment to safety consistent with Chevron's commitment. Unfortunately, for the public and the environment, Moore believes that, because substandard operators still trade, we have yet to see the worst oil spill. He foresees the future when a spill even worse than *Exxon Valdez* may well happen unless rogue ship owners and operators are driven from the business (Chevron Shipping Co, 1999a, b; Moore, personal interview, 1999).

The company formerly known as Mobil Shipping & Transportation Company (now SeaRiver Maritime) is another company that provides marine transportation services to its parent, oil giant Mobil Oil Corporation (now Exxon Mobil. All references will be to the former subsidiary and parent corporations). Mobil Shipping is the support arm for the parent, moving product by use of four fleets, based in the US, UK, France and Australia. Mobil Shipping owns and operates some 33 deep draft vessels worldwide, some 20 barges and 7 tugs in the US, and charters others. At any one time, about 5% of the oil moved by water is being moved by Mobil Shipping.

The company vets all charter vessels, using as general guidelines those established by The Oil Companies International Marine Forum (OCIMF). The company makes extensive use of the OCIMF Ship Inspection Report Programme (SIRE) database maintained in London, which contain data about the ship's condition, certifications, and operations resulting from inspections performed by OCIMF inspectors. The company depends as well upon reports from its own inspectors. A revised SIRE inspection system now uses standardized inspection questionnaires to facilitate inspections of tankers by charterers or ship owners. Mobil Shipping relies upon this system and will not use a charter if the report is negative from SIRE or its own inspectors, or the indices are that the charter vessel has major problems (OCIMF, 1993; Huber, personal interviews, 1998, 1999).

Safety is not a new concept for Mobil, as their well-developed Environmental Health and Safety Management System (EHSMS) indicates. According to Charles Huber, former Manager of Environmental Affairs, safety is a way of life with Mobil Shipping. Their top management is committed to the policy of enhancing marine transportation for Mobil Corporation while conducting such commercial business in a manner most conducive to preservation of life and protection of the environment. "To the goal of zero accidents, that of zero environmental incidents was added. Zero oil spills had always been a prime goal, but the chances of achieving it were now much better. The new goal of absolutely no insults to the environment calls for an increased level of environmental responsibility and awareness, if our grandchildren are to inherit the planet in the condition they should" (Mobil, 1998; Fullwood, 1997).

The cornerstones of the EHSMS are: open communication with all employees; an established management system; continuous improvement process; and annual peer-assessment. Key activities of the program are the following:

- Employees with accountabilities and responsibilities for each of 11 elements and 56 expectations in the EHSMS are designated in writing and annually peer assessed. Any gaps or areas for improvement are documented, prioritized and become part of the annual work plan for the succeeding year;
- A major portion of employee compensation is based on safety and environmental performance;
- Each incident is investigated using the Tap Root process and the lessons learned are shared throughout all of the fleets as soon as they are available;
- Risk-based analysis and management techniques are used throughout the company to focus attention and resources on the highest priority areas for improvement;
- An awards program for employees and contractors is in place which provides awards up to $3000 for suggestions that provide significant safety, health or environmental improvements;
- Safety meetings are held monthly on each vessel. Senior fleet managers with

responsibility for safety, health and environment meet twice a year to develop work plans and review the progress made;
- All Fleets have attained both ISM Code and ISO 9002 compliance. Additionally, the US fleet of tugs and barges was one of the first to receive Responsible Carrier certification by AWO. These safety and quality service certifications require annual internal and periodic external auditing of each vessel and Fleet Management group; and
- Two marine response teams are established with all members also holding key positions on the larger Mobil Regional Response Teams. Members of these teams are highly trained in Mobil's incident response system to work together as a team and they participate in at least one major exercise annually.

In 1997 EHSMS philosophy was so successful that Mobil Shipping experienced zero oil spilled to the environment (Huber, personal interview, 1998; Rowland, 1998; personal interview, 1998; Mobil Corporation, 1997; Mobil Shipping, 1998).

The hands-on, top-down, self-regulating safety approach of the large companies works equally as well for a small ship owner/operator. Inland Marine Service is a towboat company with four boats and 60 employees, based in Hebron, Kentucky and operating on the regional rivers for one primary customer. Its president, Cathy Shantz-Hammond gained her experience at sea. Inland Marine takes seriously its charge by its main customer to operate safe vessels. In 1994, the company joined AWO and became an ardent supporter of the RCP. What Shantz-Hammond stresses are policies, which she believes, mean safer operations for any company, large or small. These are

- Keeping in mind that, at bottom, reputation for safe operations is all that a company has;
- Access to the top, 24 hours a day for all employees;
- People-oriented management, where people are the most valuable commodity of the business;
- Hands on touch—personal involvement of the President in daily operations;
- Safety meetings weekly; and
- Cooperative work with the authorities, such as involvement in the US Coast Guard Cooperative Towing Vessel Program (Shantz-Hammond, personal interview, 1999).

The US Coast Guard instituted the Cooperative Towing Vessel Program in 1997 in cooperation with industry, to implement a system of examinations of towing vessels and to reward companies committed to quality. The mutual goals were to decrease the number of unscheduled boardings for operators who run a quality business, thus allowing the US Coast Guard to focus its towing vessel inspections more on the substandard operators. Instead of unscheduled boardings, participating companies can qualify for Phase I status, schedule examinations annually, conducted by Coast Guard and industry personnel. A decal is issued, avoiding further examinations for that year.

Phase II companies are those which have an approved quality program to manage their vessels based upon guidelines like the RCP of AWO. The qualifying company can issue its own decal, which avoids unscheduled examinations and is good for one year (USCG, 1997). Inland Marine is a Phase II company and can issue its own decals, thus regulating its own compliance with safety management programs.

The results for Inland Marine have been a near perfect safety record, with no accidents affecting the environment in the last six years. Inland Marine proves that not all "Mom and Pop" businesses are substandard operators, These smaller companies can in fact be as safety conscious and environmentally friendly as the industry giants (Shantz-Hammond, personal interview, 1999).

Ship owners and operators face substantial challenges in creating a strong link in the safety chain. Many ship owners are faced with a shortage of experienced and seafarer employees with proper training and a safety culture orientation. Part of the problem is that many ship owners and operators are subject to irregular supplies of personnel and to using less well trained merchant seamen to make up minimum crews, just to get to sea on time. The qualification system of STCW 95 should minimize this problem with its impact upon training and qualification (for further discussion of STCW 95, see Section 4.2.3 of this book). According to Capt. Martin Rowland, (Manager, Human Resources Fleet Personnel of International Marine Transportation Ltd, an ExxonMobil subsidiary) even the majors face certain gaps which must be addressed in all aspects of safety management for all ship owners/operators: increased input into industrial hygiene, drug/alcohol screening for each vessel trip, completing installation of a risk analysis system to capture problems before they create incidents and basic problems such as mariner fatigue and training the wrong man for the job (Rowland, personal interview, 1998).

Perhaps the most ironic point made by both the smallest and largest of operators is to be wary of success, meaning a lower number of accidents. The industry has not faced a major oil spill like *Exxon Valdez* (of such high notoriety) since 1989. Success can lull companies into complacency. With increasingly strong safety records and no major quantities of oil spilled, there is a great potential for a company to sit back, rest on its laurels and not maintain constant vigilance. Proactive work means a constant evaluation of potential and new risks, assessment of opportunities for improvement in operations, and keeping ahead of the regulatory requirements through self-regulation. Some ship owners and operators argue that the greatest challenge for an already challenged industry is to increase public awareness and build up a positive perception of the unique role which tankers and tank barges perform. The "Age of Intolerance" may apply, not only to the elimination of substandard shippers, but also to the creation of a more positive public view of the good ship owner/operator (Shantz-Hammond, personal interview, 1999; Moore, personal interview, 1999).

The European Commission in Brussels is attempting to produce a maritime industry charter for quality operations, supported by all ship owners and their associations. The purpose of this charter is to create a concise document which sets forth



The *Mega Borg* spilled 100,000 barrels (5.1 million gallons) of oil as the result of a lightering accident and subsequent fire, 60 nautical miles south-southeast of Galveston, Texas on 8 June 1990. Photography courtesy of NOAA OR&R Photo Databank.

in "concrete" form the operational principles of the industry that promote a "quality culture". They have focused on five key principles:

- Each link "shall make safety considerations an integral part of its activities";
- Participants shall use only ships of good standards of quality;
- Participants shall "embrace an attitude of intolerance toward substandard practices in any part of the maritime industry", promote dialogue and cooperation with other links including public authorities, and share relevant information with partners about compliance. This means "greater transparency" in the industry;
- Charters of associations shall reflect these principles and be observed by members; and
- Participants shall cooperate with relevant public authorities in evaluating progress towards this charter (Commission of the European Communities, 1999).

While this charter focuses on key and laudatory goals, its implementation is far from completion. Admiral Kime voices industry concerns: the problem of sharing relevant information with competitors and with regulators/public authorities who can "black list" members, the problem of vague and ambiguous wording, where nuances mean different things to different people, and a lack of standard construction of meaning (Kime, personal interview, 1999). In spite of these significant concerns, what such

a charter shows is how far the ship owner quality of vision has come. Stated in the charge are emerging principles that will shape the future of the industry. What the disagreements about the charter show, is that consensus about how that vision will be realized is still many years off in the future.

4.1.2. Flag State Control

The Flag State assumes a primary role in ensuring safe maritime oil transportation. In the past, the traditional, national shipping concept meant that ships flying the flag of a country were closely associated with that country. This positive connection between ship and flag more substantially guaranteed enforcement by the Flag State administration of its responsibility to implement international treaties like SOLAS, MARPOL, STCW 95 and others (for further discussion of these treaties, see Sections 3.5, 4.2 of this book). The Flag State is responsible to ensure, establish and maintain measures for the effective application and enforcement of the international conventions, the relevant instruments of which they are a party (UNCLOS, Arts. 94 and 217). When a flag becomes a signatory to and ratifies an IMO Convention, the Flag State for consistency purposes, ship owners then makes the convention part of its national law, and is bound by the treaty terms (IMO, 1996).

The modern era has seen a substantial erosion of this fundamental maritime concept (IMO, 1996). The new age has brought about multinational crews, absentee owners, and open registers, whereby a ship, by registering at a given port, attaches the nationality of that port to the ship without, in many cases, meaningful connections between the ship and the country and the trend in ship owners shifting between classifications societies as vessels age. These open registers are often referred to as "flags of convenience". The good open registers more than adequately exercise their international and national obligations (IMO, 1996; Plaza, 1998). Other Flag States may not have the resources of the more traditional shipping nations like the UK, Norway, and others. The more entrepreneurial open registers, whether because of inability or unwillingness, do not execute their shipping responsibilities. In some cases, these governments simply certificate a vessel as being in compliance with various treaties in exchange for money paid by the ship owner, without taking responsibility for determining whether the ship actually conforms to regulations.

Additionally, many of the other entities involved in the shipping enterprise have no ties with the Flag State and are outside its jurisdiction. This contributes to less interest in compliance. "Traditionally, the flag State is responsible for ensuring that IMO statutes and regulations (standards) are enforced. Yet the increasing diffusion of the industry means that many of the other components involved in shipping—the managers, insurers, builders, classification societies and so on—are all outside the Flag State's jurisdiction. This becomes a matter of greater concern when the Flag State is relatively new to shipping and has neither the knowledge, experience nor resources

of the traditional shipping nations" (IMO, 1996, 1998; Plaza, 1998; Pearson, personal interview, 1999).

The end-product is a system of Flag State administration which has been described as "flawed", with standards and regulations being inconsistently applied. Evidence of this result is that casualty rates and statistics vary between fleets and from flag to flag (IMO, 1996, 1997; 1998; Pearson, personal interview, 1999).

In order to improve this unacceptable situation, in 1992 IMO established a new Sub-Committee on Flag State Implementation (FSI) as a subsidiary to its two main technical bodies, the Marine Safety Committee (MSC) and the Marine Environment Protection Committee (MEPC). The purpose of FSI is to assist Flag States in their implementation of IMO conventions and other instruments on ships flying their flag (IMO, 1998). Since its first session in 1993, FSI has made in roads into the Flag State implementation problems and has, among a long list of actions produced these resolutions and circulars:

- Developed interim guidelines to help Flag States discharge their responsibilities more effectively (Resolution A.740(18), 1993; A.847(20), 1997; IMO, 1997e).
- Issued guidelines authorizing organizations such as classification societies to act on behalf of the Administration to carry out such tasks as surveys, ensuring compliance with ISM Code and other IMO standards (Resolution A.739(18), 1993; MSC/Circ. 788, MEPC/Circ. 325; IMO, 1995b).
- Created a model agreement and specifications for survey and certification functions by recognized organizations (MEPC/Circ. 307; MSC/Circ. 710).
- Drafted guidelines on the implementation of the ISM Code and for Port State control by Port States and Port Administrations (A.787 (19), 1995; MSC/Circ. 890; MEPC/Circ. 354; IMO, 1998)
- Drafted guidelines to assist Flag States in implementation of IMO instruments and in general, for the implementation of the ISM Code (A.847(20), 1997; A.848(20), 1997; A.880(21)).
- Drafted a Code for the Investigation of Marine Casualties and Incidents (A.849(20), 1997).
- Developed a draft circular for harmonizing reporting procedures in reports on marine casualties and incidents (MSC/Circ. 827; MEPC/Circ. 333).
- and with respect to Port State control (see discussion in Section 4.1.5 of this book), adopted Port State control procedures, dealt with training and encouraged development of regional Port State control systems (Resolution A.787(19); Resolution A.882(21), 1995; IMO, 1995b, 1996, 1997d, 1998, 1999; Plaza, 1998).

At the insistence of the IMO Secretary-General, IMO, through its FSI Sub-Committee has taken a significant step toward strengthening the role of Flag States. In December 1998, the Maritime Safety Committee approved a Self-Assessment Form to be used by Flag Administrations who are parties to IMO, as soon as possible. The

creation of such a form was in response to opinion voiced by many Member States and those in industry that they expected significant global improvement in maritime safety and pollution prevention and looked to FSI to help eliminate substandard ship owners/operators. The Self-Assessment Form establishes a uniform set of internal and external criteria which allow a country to evaluate, along with other data, how its Maritime Administration is discharging its safety net obligations by:

- Assisting Flag States to obtain a picture of how they function, based upon agreed criteria;
- Enabling Flag States to determine any deficiencies in their administrative operations and what steps to take to overcome them; and
- Helping Flag and Port States to act in a more cooperative fashion by making decisions on a bilateral basis so that problems can be solved in a cooperative way, (rather than the Port States making unilateral decisions leading to targeting and detention of foreign Flag State vessels) (Plaza, 1998). The draft Assembly Resolution on Self-Assessment was adopted at the November 1999 21st IMO Assembly (IMO, 1999, 2000).

Flag Administrations and those in industry view these IMO assisted actions as being crucial to creation of and support for a workable safety culture, a culture which must become a policy of the Governments charged with implementing existing IMO and national standards. Capt. Marvin Pontiff is the former Chief of the US Coast Guard Office of Compliance, a veteran of 24 years with the Coast Guard. The US has at least two significant roles, both as a Port State for the foreign vessel tonnage visiting US ports and as a Flag State for US deep draft tank vessels operating as domestic freight. There are about 2600 tank barges and ships comprising the US-flagged fleet, of which 200 are tank ships. In the area of compliance, the US Coast Guard applies a rigorous system of inspection, from initial plan review, construction inspection in the shipyard, to periodic lifetime inspection of US flag vessels that receive an US Coast Guard certificate of inspection, subject to an annual inspection. Inspectors are trained at the US Coast Guard's training center in Yorktown. Inspections can be performed by:

- US Coast Guard inspectors;
- Partially, by the ship owner company itself through the Streamlined Inspection Program (for further discussion, see Section 2.1 of this book); or
- By other recognized organizations, like the American Bureau of Shipping (ABS), Lloyd's Register, Det Norske Veritas classification societies through the Alternate Compliance Program (NVIC, 2-95).

The results of such inspections are captured in the US Coast Guard Marine Safety Information System, and become data available to Port States (Pontiff, personal interview, 1999).

Pontiff supports the IMO Self-Assessment Form initiative as a positive step toward bolstering Flag State administration so that Port States are not doing Flag State work. The form helps a Flag State to see what kind of structure it might need to fulfil its obligations towards vessels flying its flag, the kind of organization which is in place, how well trained its inspectors are, whether they have written standards for their inspections, and how effectively a flag does its job. Pontiff views the form as a "work in process" a way for Flag States to open the dialogue about incentives for allowing vessels to fly their flags. Other countries take an adversarial point of view and are skeptical about how the assessment form will be used. They raise questions about what actions IMO will take and how those actions will impact the sovereignty of a country, if the forms reveal deficiencies (Pontiff, personal interview, 1999).

Those representing classification societies support IMO's actions in allowing other recognized organizations to perform Flag Administration duties. Steven R. McIntyre, Director of Regulatory Affairs for American Bureau of Shipping (ABS), applauds the new guidelines drafted by IMO to assist Flag States in their responsibilities and the IMO imposed mandatory standards for recognized Organizations who act on behalf of Flag States in the effective application and enforcement of international safety conventions. What is required for effective functioning of the Recognized Organization is a "close working relationship" between the Flag State and its agents. These IMO generated actions are seen as necessary to developing a safety culture:

> "For a true safety culture to begin to pervade this industry, all elements within the industry must subscribe to that ideal. In the same manner that we must become intolerant of the substandard owner or manager, of the substandard classification organization and of the Port State which welcomes deficient tonnage into its waters, we must be intolerant of Flag States which have neither the will, nor the ability, to exercise the responsibilities which are placed upon them" (ABS, 1998).

As a representative of a Flag State administration, Ivar Manum, of the Norwegian Maritime Directorate emphasizes two areas in which Flag States can encourage development of the safety culture. One is in the positive implementation of the ISM Code, which can "lay the foundations of a renewal of Flag State control and follow-up of each individual ship". The other area relates to a positive recognition by flag administrations of those companies taking proactive action in ensuring that the technical condition of their ship goes beyond the minimum regulatory requirements. For these companies, the Norwegian Maritime Directorate is recommending financial incentives, reduced "green dues" and fees, much like the Green Award (Rotterdam Port) of reduced port charges and other rewards for a certain rating obtained within the port's appraisal scheme (INTERTANKO, 1997; Ullring, 1996b).

Ultimately, there must be a policy shift in the underlying philosophy of those involved in the safety nets. For Flag State implementation, this means shifting the emphasis from creating new regulations to effectively implementing existing stand-

ards. The focus on the human element is the engine that must in the long run empower the Flag States to adopt the safety culture as the most effective way to protect life at sea and the marine environment (Plaza, 1998).

4.1.3. Classification Societies

Private Classification Societies are an integral part of the third safety net involving ship owner/operator, designer and builder of vessels. The concept of ship classification emerged as the maritime trade expanded from wood to iron, to steam, to steel ships and merchants around the world faced increasingly greater risks of loss of the ship, the cargo and crew as ships foundered, grounded and disappeared. By definition, classification means "...that a vessel is structurally sound and mechanically fit to provide for the safety of the lives and cargo it may carry". Classification societies set rules of design and construction. Then, they survey and evaluate vessels for their seaworthiness. Those ships "likely to reach their destination" were classified "A1" (Evans, 1999a; ABS, 1994).

The oldest such society was Lloyd's Register of London, initially organized in the 1700's as an underwriters' institution. This organization pioneered the concept of classification, whose main function is to provide independent technical assessment of a ship's fitness for sea. As international conventions were developed by the International Maritime Organization (IMO), convention codes and the Rules set by the classification societies evolved to define the way an assessment is performed. The class rules set target safety levels, historically focused upon the technical aspects of the ship, its design, construction, and operational condition. Surveys and assessments are scheduled on a regular pre-determined basis. The inspections determine if the ship is maintained in accordance with the Rules. If the vessel meets the standards, then the insurer underwrites the risk. To determine the seaworthiness of a ship, the classification societies review outline and detailed plans, undertake extensive stability calculations and perform studies of noise, vibration, fire risk and other structural aspects affecting safe operations (INTERTANKO, 1998; Evans, 1999a; Ullring, 1996a).

An individual society writes it own rules regarding all parts of the ship, hull, machinery, and navigation and sets standards by its rules which the vessel must meet. The major classification societies formed an association for their members, The International Association of Classification Societies (IACS) Council. IACS has another set of rules to be followed by all member classification societies. IACS members certify almost 97% of the world's fleet. IMO rules and regulations, as established by the international conventions, set the framework for the assessments. The Flag Administrations, increasingly, have authorized classification societies to carry out surveys on their behalf, and issue safety certifications under various conventions, in their name ((IMO, Res. A.739 (18)). The Port States notify the owner and "if appropriate", the classification society, in the event an inspection reveals major non-conformities

or deficiencies in the vessel's structure and operation (INTERTANKO, 1997; 1998; Evans, 1999b; Pearson, personal interview, 1999).

The job of the classification societies has expanded with the increasing recognition of the role that human error plays in injuries and accidents. No longer can the technical aspects of the ship's structure stand alone. Ship personnel, management onshore and aboard ship, technology, and risk management are primary, interdependent parts necessary for successful protection of the ship and its cargo, for safeguarding human life, and for prevention of adverse impacts on the marine environment. This augmented awareness has led one of the societies, Det Norske Veritas (DNV) to develop a "Total Safety Approach" which is unique in the field of classification. This approach recognizes that humans, their organizations and their equipment are interrelated, with one influencing the performance of the other. Marine accidents are seldom isolated, one-off incidents. Rather, they are the result or consequence of a chain of events, arising from the causal relationship of each of the interdependent elements. In addition to focusing on the roles of seafarers, shipboard and shoreside management and technology, DNV's classification rules also incorporate statutory regulations as part of its Total Safety class approach (Ullring, 1996a).

This new approach has propelled other classification societies into a proactive stance in support of the safety culture. While differences in programs exist amongst them, classification societies are involved actively in all factors that influence safety, in the hardware, i.e., the ship, the human ware, i.e., personnel, and the software, i.e., the organization and management of companies (Tor-Chr. Mathiesen, 1997). Enforcement of the maritime safety regime through classification and certification has taken on new meaning as classification societies, like others involved in the safety nets, move from a reactive to a proactive stance.

The increased scope of classification societies mirrors the underlying and evolving legal safety structure. "The early IMO conventions, like Safety Of Life At Sea (SOLAS 1929, 1948, 1960, 1974), International Convention of Load Lines, (1930, 1966) and Prevention of Pollution from Ships (MARPOL 73/78) are prescriptive. Safety goals are never stated, no attempt is made to educate the reader to the rationale for the specific requirement, and the focus is on consequence mitigation". The ISM Code, STCW 95, OPA 90 and its almost unlimited liability for polluters more clearly define:

- Safety and qualification standards;
- Quality management systems; and
- Responsibilities onshore and aboard ship of all involved in the transportation enterprise (Ullring, 1996a). (For further discussion, see Sections 3.5, 4.2.3 and 4.3.1 of this book.)

With these new regulations and requirements in place, classification societies now perform additional functions, each of which is, in part, geared toward targeting and eliminating substandard vessels and their substandard operators. As Dr. Tor-Christian

Mathiesen, Chairman of IACS Council states so succinctly, "A ship does not deteriorate by itself, but, rather, as the result of poor management" (INTERTANKO, 1997). Member classification societies to IACS are involved in these types of defining activity:

- Development and implementation of the Enhanced Survey Programme (ESP) for bulk carriers, oil and chemical tankers by IACS and the shipping industry;
- Review, development and implementation of improved safety standards;
- Development and adoption of a Transfer of Class Agreement between classification societies, to prevent a ship owner from class hopping to avoid repairs and other safety requirements required by a particular society (Collins, personal interview, 1999; INTERTANKO, 1997);
- Development of a quality certification scheme by IACS members to ensure high standard achievement and maintenance, which extends inspections beyond traditional technological safety areas; and
- Focus upon consistent and uniform ISM Code certification, and establishment of a database available on the Internet, which registers the name and number of all ships with Safety Management Certificates certified by IACS members. This has been referred to as the IACS "White List" (INTERTANKO, 1997).

The Commission of the European Communities stresses the position a classification society can play, for good or ill, in the overall safety culture picture. Classification societies, by application of the highest standards, are essential to ensuring the "structural integrity of the tanker fleet". The Commission is concerned about "class-hopping", a trend in which owners switch class to what the Commission regards as an increasing number of societies with varying standards. To remedy this problem, the Commission recommended among others: improved class surveys, sanctions against recognized organizations which do not perform their job according to high quality standards, and disclosure to Port State authorities of the condition of a ship and its complete history whenever a vessel changes societies (Commission of the European Communities, 2000).

In 1997, IMO recommended approving guidelines for the application of a Formal Safety Assessment system as a tool, using principles of risk assessment to perform a rational and systematic analysis of the rule making process affecting any shipping activity. IMO intends to apply a five-step process to an objective assessment of the need for and contents of safety regulations. The steps include:

- Hazard identification—a list of accident scenarios, their causes and outcomes;
- Risk assessment—an evaluation of risk factors;
- Risk Control options—measures available to control, then reduce risk;
- Cost-benefit assessment—an evaluation of the costs and the benefits of each option; and
- Decision-making recommendations—about hazards, their risks, the cost-effectiveness of the options to reduce risk (IMO News, 1997b; Tor-Chr. Mathiesen, 1997).

Classification societies have adopted this Formal Safety Assessment system to reassess their own Rules and requirements for every aspect of ship classification. For example, ABS has undertaken a formal reassessment of its own regulations, based on a similar rational and systematic analysis of risk. First, ABS defined safety, determined how risks could be mitigated, established a risk template to create new Proposed Machinery Rules, and took the old rules and mapped them within a risk model of a ship. Using this model as a template, ABS intends to perform a comprehensive reassessment of all other rules. ABS's review of its Rules for their modern applicability, given technological advancements, will be coordinated with IMO's efforts to introduce risk- and reliability-based criteria into all rule making. The end result should be greater consistency for owners in designing safer ships and for classification societies, in a more uniform application of their Rules (INTERTANKO, 1997).

An examination of actions taken by two of the major classification societies to promote the safety culture shows just how effectively these entities can influence ship owners toward adoption of the safety culture. ABS is one of the three largest classification societies worldwide, which is recognized as qualified to act on behalf of Flag Administrations. This is not a given carte blanche. Each individual Flag must recognize ABS in order for it to act in this capacity. First called the American Shipmasters' Association, incorporated in New York, in 1862, it had a primary purpose of developing the Merchant Marine of the US Since that time, ABS has evolved into a global organization with its non-for profit organization represented in 81 countries and its for profit organization of ABS Group of Companies, represented in 20 countries. ABS classes over 47% by number of the world's fleet of self-propelled vessels of more than 100,000 gross tons (ABS, 1998)

ABS has committed its more than a thousand employees to the safety culture concept, based upon the belief that a ship can no longer be viewed in isolation, but rather is seen as a part of the activities of the whole company, from risk management and training of personnel to maintenance. Safety pays. The ISM Code, STCW 95 requirements, ISO 9000 quality standard and ISO 14000 environment standard provide the foundation for the safety culture. Within this setting, ABS sees its job as deleting technological standards which are obsolete, clarifying those which remain applicable, and ensuring that the vessels it classes are implementing international convention standards fully (Pearson, personal interview, 1999). Unfortunately, as ABS points out, some classification societies have not been doing their job. Adoption of a proactive stance and willingness to be part of an industry which regulates itself is the only way forward, says the Chairman of ABS:

> "The safety net is being tightened by a growing band of increasingly well informed and very conscientious Port State regulators . . . . Do we want an industry which is regulated by governments? Or do we want an industry which is perceived by those governments as having the maturity, ability and the collective will to regulate itself" (INTERTANKO, 1997).

ABS meets the challenge of self-regulation by these types of actions:

- Instituting a training program for Lead Surveyor and Veteran Surveyor to build on the professional skills of the most experienced surveyors and disseminating these experts throughout the worldwide network of ABS surveyors as valuable resources;
- Updating Guidelines for Port State Inspections for owners, masters and crew to understand what areas will be the subject of scrutiny by Port State control inspectors;
- Using the Formal Safety Assessment concept promoted by IMO to review all ABS Rules from a systematic, risk-based approach;
- Developing Guidance Notes on the Application of Ergonomics to Marine Systems, to incorporate the concept of the human element into the design of vessels so that they are conducive to an effective operation of the ship;
- Acting as a Recognized Organization for almost 100 Flag Administrations;
- Creating the *SafeHull* ship design and structural assessment method, a state of the art engineering approach aimed at evaluating each structural component and the entire structure of a ship based on a determination of where the greatest stresses will be experienced within the hull and what the required strength of the components will need to be, all within a living, non-static environment. This approach serves as a guide to ship designers to construct stronger, safer ships (ABS, 1998); and Creating the "SQE" management notation.

SQE is the Marine Safety, Quality and Environmental Management Systems Guide (Pearson, personal interview, 1999). This Guide's requirements are founded on the standards of the ISM Code, ISO 9000, and ISO 14000. The Guide has been written as a series of integrated management system requirements encompassing the full scope of safety, quality and environmental management. The Guide identifies which requirements apply to the distinct aspects of safety, quality and environmental management and illustrate how they interrelate. Ship owners/operators can plan and develop management systems suitable to their individual company's objectives and then expand systems as their objectives change. The SQE Guide may also include the Bureau's own prescribed requirements. These requirements are applied within the Guide where ABS identified a need for more effective or defined control. This includes, for example, enhanced management system requirements, specific aspects and impacts which must be addressed, and specified objectives. The Guide will be updated annually. Companies are allowed one year after revision of the Guide to comply with changes to requirements. Companies select from four choices of certification to the SQE Guide requirements in accordance with the scope of the management system they operate. Certification is evidenced by certificates issued to the Company's office, and each ship certified under the program. In addition, ABS-classed ships certified under the program have a compliance notation placed in the ABS record. The following notations will be used to evidence compliance in the ABS record: S indicates

compliance with ISM Code and Guide safety requirements; SE indicates compliance with ISM Code and Guide environmental requirements; SQ indicates compliance with ISM Code and Guide quality requirements; SQE indicates compliance with ISM Code and Guide safety, environmental, and quality requirements.

DNV is a leading ship Classification Society, established in Norway in 1864. Today, DNV has over 300 offices in 100 countries, classes more than 4400 vessels, of which 750 are oil tankers, representing 15% of the world's fleet (Evans, 1999a). DNV takes its mission of safeguarding life, property and the environment very seriously. DNV has developed what it terms the "Total Safety Class", which involves an integrated approach to classification by linking technology, operational matters and the human element with environmental protection. These factors and consideration that company management of the vessel on board and ashore is crucial to safety influenced DNV to develop a model safety management system for the industry, its Safety Management and Environmental Protection Certification, referred to as *SEP*. This is a voluntary classification notation which certifies that a company has a safety and quality-assurance assessment system in place which is in full compliance with the ISM Code and appropriate elements of the ISO 9000 quality management standard. More importantly, many of the SEP requirements are based upon DNV's loss control principles and include consideration of sound operational practice (Evans, 1999c; Collins, personal interview, 1999).

DNV's Total Safety Class initiatives include these:

- Including within the traditional classification of ships, certification of management systems in compliance with ISO 9000 and ISO 140000, as requested;
- Providing consulting services in the area of risk and reliability, built on Loss Control Management;
- Project Risk Management;
- Loss Control Management;
- Incorporating statutory requirements into DNV Rules and conducting statutory surveys as a Recognized Organization for more than 130 Flag Administrations;
- Certification of crewing agents, maritime academies and training establishments, under STCW 95. DNV has certified the quality standard systems for the three leading training centers in the US (for further discussion of STCW 95, see Section 4.2.3 of this book); and
- Introducing the concept of risk-based machinery survey rules, to institute in the system of inspection a more functional based view of inspections based upon risk-based inspection techniques and risk analyses. This means, in practical terms, that equipment will be opened at intervals depending upon probability or likelihood of failure, as well as criticality and severity, and not only during a scheduled survey (Evans, 1999c; Collins, personal interview, 1999).

These and other activities of DNV make it a leader in its field. Sven Ullring, the President and CEO, has delivered many keynote addresses throughout the world,

encouraging the shipping industry to move from an "evasion or compliance" culture to a "safety culture". He argues eloquently that the "cluster of actors in shipping" must actively engage in this shift.

> "We believe that it will be required to bring about a change from the current position of rather prescriptive regulations in shipping and for some owners reluctant compliance, to a state also including more self-motivated and partly self-regulated improvement in all relevant aspects. Economic forces are drivers in shipping. Financial incentives, rather than punishment, may be a more dynamic way to obtain lasting improvement with regard to overall environmental performance of the maritime industry as well as other industries. All stakeholders have a responsibility in this enterprise. Insurance companies, port operators, etc. are in positions to give financial reward to high environmental performance based on measurements and credible documentation of environmental performance" (Ullring, 1996b).

ABS, DNV and other classification societies can perform their evaluation function and help shape the industry response to the challenges of the millennium. In the final analysis, the more extensive and inclusive evaluation function of classification societies may be one of the strongest links in the responsibility chain. Their focus centers on not just technical inspections, but also on inspections of operational, human element aspects. As recognized organizations for Flag Administrations, classification societies can recommend denial of a ship owner's right to trade for those ship owners/operators who do not have a quality management system in place, nor trained and qualified mariners manning their ships, nor vessel certification in compliance with the latest technological standards. Appropriate use of this power can do much to eliminate or reform substandard shipping.

4.1.4. Protection and Indemnity (P&I) Clubs/Insurance

The insurance industry with its various forms of marine insurance is part of the "cluster of actors" in the business community of shipping, which can create the "safety culture". The Protection & Indemnity clubs (P&I), cargo and hull underwriters and other insurers are responding to these changing times. The industry is influenced by both financial and political/public pressure. While there are actual environmental collaborations, such as that formed by leading companies working with the United Nation's Environmental Program, the real avenue of change may come from the positive influences these companies can have from within upon their own insureds, the ship owners/operators (Ullring, 1996b).

Marine insurance is one of the oldest forms of insurance, dating back several thousand years in its connection to shipping. Maritime trade has depended upon insurance in the form of mutual marine insurance clubs and individual insurance companies for

transporting cargo around the world. "A well-developed insurance network is a pilar of almost any modern economic system. By reducing the economic risk and spreading potential loss to several parties, the different insurance organizations have, to a large degree, created the base for economic expansion and security in a variety of fields, perhaps particularly in the shipping field". Protection is needed for not only the ship and its cargo, but also to cover the threats which shipping poses to humans and the environment. In its simplest form, merchant mariners need three types of insurance: marine insurance, war risk insurance and P&I insurance (Thowsen, 1998).

The system is internationally based, with the primary companies reinsuring their risks among themselves and in the international market. The insurance industry depends upon the classification societies to minimize the risk that the insurance institution may face. Through construction supervision and the surveys and inspections performed by these societies, they provide insurance companies with a rating basis for their premium calculations. Just as importantly, classification societies perform a loss prevention function. Insurers and classification societies are interdependent parts of the safety net (Thowsen, 1998).

"...Marine insurance is the oldest form of indemnity of which there is any record". Many diverse risks are included within the basic classes of coverage, outlined generally as hull, cargo, freight and marine liabilities (Rave, 1991). Marine insurance for any vessel is complex. One vessel may have many separate policies with different underwriters, with coverage placed in multiple countries. The principal types of coverage, most applicable to oil spills, are:

- *Hull insurance*—covers the vessel, machinery, liabilities arising from collisions, general average and salvage charges from physical damage and losses due to certain "named perils", including errors in navigation and accidents. After a substantial threat of pollution or spill is under control, primary responsibility for salvage of the vessel may rest with the hull insurer.
- *Cargo/container insurance*—covers general insurance for loss of cargo for the owner of the cargo. The ultimate payment of loss is based upon an allocation of liability for the loss.
- *Protection & Indemnity insurance*—covers most liabilities not provided for in the hull policy. Historically, "Protecting" risks, were those such as personal injury, loss of life, dock damage, wreck removal. "Indemnity" risks were those arising from the ship owner's contractual undertakings, such as cargo claims. This insurance is in respect to third party liabilities. As in the case of those clubs belonging to the International Group of P&I Clubs, (The Group) pollution risk by oil or other substances is covered up to the present limit of $500 million (This limit may be increasing, to $750 million or even $1 billion), (Martowski, personal communication, 1999).
- *Excess* P&I insurance—covers losses in excess of the primary layer of P&I insurance, when those limits have been reached.

- *Miscellaneous insurance*—covers many other losses, such as tower's liability for tug and tow vessels involved in a casualty, freight, total loss only, war and strike (Garger, 1999; Martowski, 1998a).

Oil pollution risk coverage under standard P&I Club rules generally includes these items:

- Liability for loss, damage or contamination;
- Loss, damage or expense which the owner incurs or for which he is liable as a party to a specific contract which the Club directors approve;
- Costs of any measures "reasonably" taken to avoid or minimize pollution, or loss resulting from such measures;
- Costs of measures to prevent imminent danger of discharge; and
- Costs or liabilities incurred in compliance with an order or directive given by a government or authority to prevent or reduce risk of pollution (UK P&I Club, 1999).

Each of these compensable items is subject to further limitations as the Directors may determine under other Rules of the Club. These rules track consistently with the general principles of compensation for oil spills established by the International Oil Pollution Compensation Funds (For further discussion, see Section 4.3.3 of this book). Such oil pollution coverage may be conditioned further by the Directors' determination that the owner must pay an additional premium for certain trade. For example, in order to trade in the US, the UK P&I Club Rules require ship owners to pay an incremental premium (UK P&I Club, 1999).

P&I Clubs are the predominant providers of P&I insurance against exposure to third parties arising from vessel operations, as well as liabilities for excess collision risks and loss or damage to cargo. P&I Clubs provide the underwriting for almost 95% of the world shipping fleet (Etkin, 1998). P&I Clubs use the form of the small mutual hull clubs of ship owners in England to share hull risks on a mutual basis. The first such club was established in 1855. Clubs are essentially non-profit making, composed of ship owners and time charterers who share their liabilities on a mutual basis. Clubs are governed by a Board of Directors and run by Managers who are responsible to the Directors. "Mutuality" of sharing loss is the governing principle—the member clubs pool their larger claims, and are provided with layers of insurance and reinsurance by a set scheme (The amounts described apply to the 1999 policy year). As an example:

- Five million dollars per claim for each individual club's retention;
- Claims exceeding $5 million and up to $30 million fall into the "Group Pool";
- Claims in excess of $30 million and up to $2 billion are within the Group's second layer of reinsurance, placed on the world insurance market; and
- The UK P&I Club provides a catastrophe reserve of further protection in the approximate amount of $230 million.

A P&I Club is not the guarantor for its members, but rather it is the source of funding insured liabilities. As such, the clubs are "indemnity underwriters", reimbursing the member after the member pays the claim or expense in the first instance. At the beginning of each year, the club levies an "advance call" on each ship owner at an agreed dollar rate per gross ton "... based on the risk that each member brings to his fellow club members—that is the type, age and condition of his vessels, the quality of his management, masters, officers and crews, his trades, and of course, his loss record, and so forth". The advance calls are invested and that fund is used to pay claims, and administrative and reinsurance costs. A "supplementary call" is levied if the advance call is insufficient to pay that year's claims (Martowski, 1998a, b).

The Group, which represents 14 clubs and their ship owner/charterer members, was first formed in 1899. The Group insures over 450 million tons of owned or chartered tonnage, about 94% of the world's ocean going shipping. Each club's liability in The Group for oil pollution risks is presently limited to $500 million, (which amount may be increasing) for each entered ship for each accident or occurrence. Again, the concept of "mutuality" is important for pollution prevention and safety. The peer pressure of mutuality works to ensure that each member of the club and each group club maintain proper standards on ship and ashore, as each participates in the general risk-sharing venture (Martowski, 1998a; INTERTANKO, 1997).

The Water Quality Insurance Syndicate (WQIS) provides a different system of insurance in the United States than that of the P&I Clubs. WQIS consists of a group of 18 insurance companies from the American market, who have entered into a contract between themselves to provide marine insurance for pollution liabilities imposed by OPA 90 and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC Sections 9601 et seq). WQIS insures approximately 40,000 vessels. WQIS is the largest domestic insurer of such marine pollution. Each of the different companies in WQIS agrees not to compete in certain areas of business, so that the same coverage at the same rates is provided for vessels that are subject to OPA 90 and CERCLA regulation and are of 100 to 20,000 gross tons.

Coverage is available from WQIS in connection with traditional P&I Club coverage in those cases where the P&I Club chooses not to cover pollution damage. Unlike the P&I Clubs, WQIS acts as a direct guarantor for ship owners and operators under the OPA 90 requirement that vessels operating in US waters must evidence financial responsibility to meet maximum liability imposed by that law (See Section 4.3.5 of this book for further discussion). WQIS is the largest such provider of such financial guarantees, accounting for more than 28% of all Certificates of Financial Responsibility which the US Coast Guard issues to evidence a vessel's compliance (Hobbie, 1995; personal interview, 1999).

Whether insurance is provided for a vessel under the P&I Club or the American scheme, certain basic principles govern the rights and responsibilities of the assured and insurer. It is within the context of these legal relations, that the insurers can effect the greatest change upon substandard operators. The duties and obligations between

insured and insurer arise from direct contract language and from common law principles. Most marine insurance contracts contain standard clauses which set forth the scope, conditions and special areas of coverage.

Certain standard clauses are:

- The duty of *dealing in utmost good faith*—which requires forthright disclosure by the assured. This includes, for example, typical warranties in cargo policies as to value and quality of shipments (Rave, 1991);
- The *Sue and Labor Clause*—which requires the assured to exercise care to protect the property insured from loss. This obligation occurs after an incident, such as an oil spill. The obligation has been defined as follows: "(A)n assured has the duty toward his underwriter to exercise the care of a *prudent uninsured* owner to protect insured property in order to minimize or prevent the loss from the occurrence for which the underwriter would be liable under the policy" (*Reliance Insurance Co. vs. The Escapade*, 280 F.2d 482, 1961 AMC 2410 (5th Cir.1960), n108). This indemnification clause provides that, if the assured acts in a reasonably prudent fashion, the insurer will pay the company back for the liability incurred. Reasonable does not necessarily mean cheap, but rather refers to what is prudent under the circumstances. For example, an initial response to an oil spill in the US may mean that the master of the vessel orders 1000 feet of boom to be placed around the hull, then makes the notifications required under OPA 90 to the National Response Center, the US Coast Guard, and finally, WQIS if that is the insurance carrier (Rave, 1991; Carden, personal interview, 1999; Hobbie, personal interview, 1999).
- Under typical P&I Club rules, such liability may extend only to costs and expenses incurred with the agreement of the Club Managers or which the Directors, in their discretion, decide to reimburse to the owner (UK P&I Club Rules, 1999, Rule 2, Section 25A). A breach of this all important obligation may lead to rejection in whole or part of an owner's claim (UK P&I Club Rules, 1999, Rule 5M).
- *Seaworthiness*—the ship must be sent to sea and maintained in a seaworthy condition. Because it is the job of the clubs or pooled insurance companies to insure and pay claims of their members, this clause is applied to deny coverage only in those situations where the owner "knew or ought to have known" of a defective condition and could have taken timely action to intervene and prevent loss. The rule does not generally apply to revoke coverage in the case of mere negligence, such as an act by master or crew over matters of maintenance. For this defense to be available to the insurer, there must be willful misconduct of the insured or active knowledge. This area of warranty and defense to liability may be changing with the changes in the ISM Code (see discussion below), (Det Norske Veritas, 1997, Section 3-22; Carden, personal interview, 1999).

- *Compliance with all Flag Administration Statutory Requirements and Class Rules*—public authorities, such as the Flag Administrations, issue their own safety regulations, based upon International Maritime Organization conventions. Ship owners must comply with all requirements concerning all levels of operation, technology, and the ISM Code. Classification societies incorporate these regulations into their own set of Rules, that govern all physical and operational aspects of the ship. Ships must be classed with an approved classification society during the term of coverage. Repairs required by such a society must be undertaken. The ship owner must insure that the ships in his fleet remain in compliance. Once classed, the ships must continue to meet these conditions. The ship owner is required to report any change in classification society to his club.
- The Flag State, classification society and insurer may conduct a series of periodic surveys and inspections to determine compliance. While insurers do not regard themselves as policemen, assessments of ships before they enter the P&I Clubs and during a ship inspection program determine if the ship owner is complying with the statutory requirements in practice. Breach of this condition may limit liability of the insured to loss not caused by the breach. For special safety regulations set out in the insurance contract, negligence of any person responsible on the ship for the regulation is imputed to the ship owner (Det Norske Veritas, Section 3-25; Carden, personal interview, 1999; UK P&I Club Rules, 1999, Rule 5K).

As Richard Hobbie, President of WQIS, states so succinctly, the impact on the ship owner of these insurance clauses will eventually drive the substandard owner out of the industry: "If the shipowner is not in compliance with the statutory requirements, they will be charged higher premiums or will not receive coverage from any insurer. If the owner has losses while covered, which are a result of noncompliance, he will be denied coverage" (Hobbie, personal interview, 1999).

Perhaps the single most important innovation in the control over substandard ships is the incorporation into the standard policy of marine insurance of the condition of compliance with the International Safety Management Code (ISM Code). In October 1997, The Group recommended to their respective Club's Boards that each Club's Rules be amended to incorporate as a minimum standard these requirements:

- That each member be in possession of a valid ISM Code certificate;
- That the member be denied the right to recover any claims for a period during which ISM Code requirements are not fulfilled; and
- That clubs include ISM Code requirement checks during their ship inspections to make sure that there is an effective safety management system in place (Martowski, 1998b).

All group clubs have adopted such minimum language and some have amplified the same with even stronger requirements about ISM Code compliance. WQIS has

similar code language requiring compliance by the owner with the provisions of the ISM Code if the vessel's Flag Administration requires that. The operator must ensure that the vessel is operated in accordance with such provisions (WQIS, 1999). P&I Clubs will not accept new tonnage, without proof that the owners have valid ISM certifications, nor will they renew memberships without similar evidence of ISM Code compliance.

The question remains: will the clubs enforce such compliance and/or refuse coverage in the event of an incident resulting from ISM Code compliance failures such as the vessel failing to have a functioning safety management system, continuous repair audits, a high ranking official onshore to whom the ship reports in the event of an incident, and any one of the many other elements of an operational and effective ISM Code system. (See Section 3.5 of this book for discussion of the ISM Code.) This is an emerging issue for the insurance industry. On the one hand, insurance policy seems to favor, as a mutual club or pool, covering losses unless there has been willful misconduct on the part of the owner. If such a safety management system is not in place and an incident results, under this traditional view, there is a reluctance to deny coverage.

On the other side of the picture, there is a growing belief that the requirement of a paper trail, of self-audits leading to disclosure of non-conformities, improperly functioning equipment, and lack of safety management systems, each of which deficiency is to be reported to the designated high ranking person in the company, will increase the "transparency" of operations. The end result may be that the insurer has a greater chance of understanding what led to an incident and may be able to assert non-compliance as a defense to coverage. In this period of transition, the managers of the clubs prefer to use their "Omnibus Rule" power to determine on a case by case basis whether or not costs or expenses, and claims of the insured should be covered. Certainly, this is an area which bears watching in the future, as the proper application of the ISM Code will make it increasingly difficult for an owner not to know what is transpiring in his company. The goal of the ISM Code contract clause and the other loss prevention provisions of the policies is to have safer and more reliable ships, with fewer incidents (Carden, personal interview, 1999; Ostensen, personal interview, 1999; Hobbie, personal interview, 1999).

On the practical side, the insurance industry has used these warranty clauses to institute prevention programs that are having a lasting effect on safety. The Group has specific rules, which the individual group clubs personalize:

- All vessels must be classed by a classification society approved by the Club Managers;
- Each club must have a ship survey programme for quality control in place;
- ISM Code certifications are a condition of coverage, in keeping with the concept that mutuality demands compliance with high standards
- Members are to develop quality control and loss prevention strategies (INTERTANKO, 1997).

The UK P&I Club is the largest of the clubs with more than 100 million tons of owned and chartered tonnage, representing 700 fleets with 6000 ships, flying the flags of 85 countries. The UK P&I Club serves as an example of the special action undertaken to implement The Group's outlined requirements:

- In October 1997, effective as of 20 February 1998, the UK Club amended its Rules (Rule 5K) to require compliance with the flag's statutory requirements, and particularly with the ISM Code, making this a condition of coverage.
- In 1998 the UK Club adopted a regional structure for handling claims, with three key zones, Europe, the Americas and Asia, and with chief correspondents in each, for more efficient handling of claims.
- The club serves as a leading source of data for the industry by providing a Major Claims Analysis of the causes for claims of $100,000. This has been regarded as the "industry bible" on liability claims. The latest edition was published in 1999.
- Research and development into the human factor produced a model study about the role of fatigue on safety in ship manning, the publication titled *The Human Factor: A Report on Manning*.
- In 1990, the UK Club launched its all important Ship Inspection Programme which is summarized in the UK Club's publication, Ship Inspection Report. The program was established in response to P&I claims which peaked in 1990. As a result, the UK P&I Club was determined to carry out its own ship visit program, with its own inspectors employed by the club, who visit worldwide between 500 and 600 ships annually, picked on a random basis. The purpose of the inspections is to look at the ships from an insurance risk basis and determine if the companies are conducting business with the highest standard of care and in compliance with all statutory regulations. ISM Code compliance has been highlighted. These inspections supplement, rather than supplant classification society inspections, and focus upon factors relevant to the liability of the club, including crew experience and training, safe working practices, safety management policy and pollution control (Martowski, personal interview, 1999; Carden, personal interview, 1999; UK P&I Club, 1996a, b, 1998).
- In 1996, the UK P&I Club launched a pre-spill networking initiative with the US Coast Guard Captains of the Ports and other federal and state environmental authorities. This basic presentation, which has to date covered 20 of 30 states in the US, sets forth the club's structure, coverage, reinsurance contracts and other relevant information and is intended to build working relationships with the decision makers prior to the occurrence of a major casualty.

David Martowski, Chairman of Thomas Miller (Americas), believes that the ship inspection program is the most effective loss prevention initiative that a P&I Club can undertake. As a result of its inspection program, the UK P&I Club has asked 4 million tons of unsuitable shipping to go elsewhere, and has seen an increased compliance with safety by its members, such that the number of ships failing the

program has decreased from a high of 15% in 1990 to just 4% in 1998 (Martowski, personal communication, 1999). These inspections focus upon the human element as well as ship maintenance by those involved in the program, which accounts for its success. Leadership follows from the top down. The fleets owned/managed by the UK P&I Club's Directors were the first to be inspected when the system first started. As indicated by this leadership action, the members at large were motivated to take this loss prevention/safety initiative very seriously (Martowski, personal interview, 1999).

There is one other area in which the insurance component of the safety net can promote good shippers, while discouraging the bad. This is in the area of premiums. The occurrence of spills appears on a company's loss record and impacts rates for a number of years following the spill. In determining rates, the club will look at the manner of operation, the type of trade, US or international, the seaworthiness of the vessels, whether the vessels are single or double hull, their age, and what type of operator the company is. Mutuality, the pooling concept, guarantees that there is a clear rate differential between the good and poor operators (O'Connor, personal interview, 1999).

However, while the various underwriters/insurers agree upon the need to penalize the substandard ship owner, the current "soft" market conditions make for a difficult time in rewarding those who are responsible operators. All clubs are running underwriting deficits, i.e., they are not bringing in enough premiums to cover the outgoing risk. There is intense market competition for a relatively fixed market. Ship owners can shop their business. These conditions lead some in the insurance business, like Richard Hobbie, President of WQIS, to state that the insurance industry can not have a meaningful impact by reducing rates, because of the already bare bones premiums charged to good operators (Hobbie, personal interview, 1999). The Norwegian marine insurance industry points to the weak market as making it exceedingly difficult for effectuating price differentiation for hull insurance, or for those in marine insurance such as the marine underwriters, to be proactive, to "take firm effective action by imposing restrictive terms" (INTERTANKO, 1997).

The long-term view, in spite of a short lived economic downturn in the insurance market, is that the soft market will "harden" and quality underwriting will make a difference. The P&I System is based on the fundamental principle of mutuality. First-class ship owners are unwilling to share club losses with substandard operators unwilling to pull their weight.

4.1.5. Port State Control

Plaza (1998) has described Port State control as the last of the safety nets protecting human life and the environment from accidents and oil spills. Port State control provides the "teeth" Flag State administrations lack when they do not implement regulatory provisions of basic international conventions. Certain of these treaties allow Governments the right to inspect ships visiting their ports to ensure that they meet

convention requirements. "Envisaged very much as back-up action by the flag State, port State control (PSC) has become much more important in the last few years, partly because flag State implementation alone has proved unable to detect and eliminate substandard shipping" (Plaza, 1998).

Until increasing pressure upon Flag Administrations has global impact, Port States, perhaps unfairly, must perform the Flag States' job. The Secretary-General of IMO described the inevitability of this system: "It has been pointed out that this division of enforcement responsibilities means that port States are taking on the job which flag States have failed to do satisfactorily, and some are complaining about the costs involved. But what is the alternative? . . . Anyone who believes that the cost of preventing accidents is too high needs only to look at the costs involved when an accident does happen" (IMO, 1996).

Initially, Port State control was limited to enforcement of technical aspects of the major conventions. The scope of inspections ("examinations" in US parlance) expanded, beginning with the new chapter XI, Regulation 4 of SOLAS in May, 1994, (in force as of January, 1996) to include the right of a Port State control officer to check operational requirements if "clear grounds" existed: i.e., "when there are clear grounds for believing that the master or crew are not familiar with essential shipboard procedures relating to the safety of the ship". IMO annex to Resolution A.742(18), 1993, defines such clear grounds as being:

- Operational shortcomings;
- Improperly conducted cargo operations;
- An incident involving the ship which is operational/human error based;
- An absent up-to-date muster list;
- Failure to meet minimum manning regulations; and
- Evidence of the inability of key crew to communicate amongst themselves.

MARPOL 73/78 has similar provisions to the SOLAS "clear grounds" (IMO, 1997d, Secretariat of PMOU, 1996). The ISM Code and STCW 95 provide even stronger authority for Port State control officers, who can inspect for operational aspects affecting safety management systems, competency of crew, fatigue and other human element oriented problems. (For more information see discussion in Sections 3.5 and 4.2.3 of this book.)

Relevant sections of international conventions containing provisions for Port State control, include, among others:

- "SOLAS 74, regulation I/19, regulation IX/6 and regulation XI/4;
- Load Lines 66, article 21;
- MARPOL 73/78, articles 5 and 6, regulation 8A of Annex I, regulation 15 of Annex II, regulation 8 of Annex III, and regulation 8 of Annex V;
- STCW 78, article X and regulation I/4; and
- Tonnage 69, article 12" (IMO, 2000a).

Port State control can be costly because enforcement requires an active administration: a team of surveyors and inspectors, training and maintenance of these individuals, and data control. Energy and time of the administration is directed toward a common goal of eliminating substandard ships. Recognizing the cost issue and also the value of sharing data between Port States, IMO initiated a policy to create a global network of regional Port State control systems, composed of countries in linked regions who collectively operate under memoranda of understanding or agreements. Acting together, the regions and in turn the global system can increasingly diminish the sphere of operation of substandard ships. IMO effectuated this global concept from Resolution A.682(17) on regional cooperation on Port State control in 1991 (Plaza, 1998).

The oldest and most established such regional agreement is the Paris Memorandum of Understanding on Port State control ("the Paris MOU"), adopted in Paris, France in January, 1982, (effective 1 July 1982) by a group of what has now become 18 countries. The geographical scope includes European coastal states and costal states of the North Atlantic basin from North America to Europe (Secretariat PMOU, 1996). The Paris MOU, with its secretariat in Den Haag, Netherlands, has succeeded and has served as a model for five other regional agreements. To date, these are the other regions and agreements of effective cooperation in Port State control:

- The Acuerdo de Vina del Mar (Latin-American Agreement), signed in Chile, 5 November 1992;
- The Memorandum of Understanding on Port State control in the Asia-Pacific Region (Tokyo MOU), signed in Japan, 1 December 1993;
- The Memorandum of Understanding on Port State control in the Caribbean Region (Caribbean MOU), signed in Barbados, 9 February 1996;
- The Memorandum of Understanding on Port State control in the Mediterranean Region (Mediterranean MOU), signed in Malta, 11 July 1997;
- The Indian Ocean Memorandum of Understanding on Port State control (Indian Ocean MOU), signed in South Africa, 5 June 1998 (Plaza, 1998); and
- The Memorandum of Understanding on Port State control for the west and central African Region (Abuja MOU), signed in Abuja (Nigeria), 22 October 1999 (IMO, 2000a).
- The Memorandum of Understanding on Port State control for the Black Sea region, signed in Istanbul, Turkey, on 7 April 2000 (IMO, 2000h).

"Port State control is a system of harmonized inspection procedures designed to target substandard ships with the main objective being their eventual elimination from the region" (Secretariat PMOU, 1996). In reaching this goal, each of these accords shares common characteristics, one of the chief being a target inspection rate for ships visiting the ports in the agreement region. Generally, such inspections are unannounced and do not take place within six months of a prior inspection unless "clear grounds" exist. For ships of non-parties to the international conventions, who do not have

certificates on board which show satisfactory compliances, there is an international principle which applies. The "no more favourable treatment" principle means that these ships are subjected to a more detailed inspection, but the Port State control officer must follow the same guidelines provided for ships who are parties to the treaties (Secretariat, PMOU, 1996).

To facilitate the global initiative and consummate adoption of MOUs by other regions, IMO developed a standard practice. This systematic approach focuses upon four stages: a review of the region's maritime safety infrastructure for surveys and inspections; convening of regional meetings of experts to discuss a draft agreement; convening of a meeting of Heads of Maritime Administrations and Governments officers to establish a training plan and sign the MOU; and preparing a strategy and future plan of action for implementing the agreement (Plaza, 1998; IMO, 2000a).

Fernando Plaza, the Senior Deputy Director of IMO's Maritime Safety Division, regards the MOUs as being the beginning, not the endpoint of the Port State control process. IMO's new millennium project is to facilitate harmonization of procedures, cooperation, and most importantly, exchange of information between the various regions, starting in the year 2000. Shared data on substandard ships, about, for example, those detained for failure to comply with the requirements of international and national agreements, are possibly the most important step to be undertaken by the countries who are members to the various MOUs. With fewer places to hide, the bad shippers will be out of business.

Information sharing signals a policy change. "Armed with the information made available as a result of regional cooperation in PSC we must work towards a change of attitude within the shipping industry, where a long tradition of secrecy too often results in problems being hidden and ignored rather than revealed and solved. The development of port State control gives us a chance to challenge that culture and replace secrecy with openness" (Plaza, 1998).

An example of the power of data sharing under Port State control MOUs is the inspection campaign waged by the Paris MOU. From 1 July to 30 September 1998, Port State control officers conducted a Concentrated Inspection Campaign, on implementation of the ISM Code, focused upon ships entering the 18 member countries making up the Paris MOU (The US and Iceland are associated as "cooperating maritime authorities". Members of the Toyko MOU attend Paris MOU meetings as well.) During this period, 1575 ships, representing about half of the ISM Code obligated ships entering the region, were inspected and tested for key elements of their safety management systems. (For discussion of the ISM Code, see Section 3.5 of this book.)

The results were mixed, 81 ships were detained for major non-conformities, a rate of 5.1%. Three were banned from the region for failure to have ISM certificates on board. The bulk carriers were the largest non-complying category of ships, with chemical and then oil tankers next in line for safety management system failures. Twelve Flag States had more than 10 ISM inspections with high rates of non-compliance. Five classification societies responsible for classing the ships on behalf of the Flag States

had ships with rates of detention in excess of 9%. The main areas of management system failure were basic to a functioning ISM Code, such as lack of certificates, no "designated person", no maintenance routine and no records. (According to Richard du Moulin, former Chairman of INTERTANKO, those vessels detained were smaller tankers, operated under weaker flags.) Less than one-third were INTERTANKO members, although the association of international ship owners/operators makes up almost two-thirds of all tankers), (du Moulin, personal communication, 1999).

All these data are available to other Port States by internet access and through the Paris MOU's SIRENAC database, which will be made accessible to any interested user in the near future. The database is administered in St. Malo, France. In keeping up with technological advances, communication features have been enhanced and windows software has been installed for better on-line access as of 1998 (Paris MOU, 1998; Secretariat PMOU, 1999). As a further significant step, the Paris MOU will make more information available to all users of the system called EQUASIS (European Quality of Shipping Information System) in support of the worldwide Quality Shipping Campaign. Such information will include, among others, a monthly listing of companies whose ships have been detained more than once or which have more than one ship detained within the previous twelve months. Data as to the performance of classification societies vis-à-vis detentions will be available as well (Paris MOU, 1999b).

The Commission of the European Communities stressed the importance of greater transparency regarding tankers by proposing amendments to prior Council Directives, particularly involving EQUASIS information:

> "Greater *efficiency*: inspectors will have more information on the ships to be inspected via mandatory consultation of the EQUASIS database on ship quality. In addition, inspectors will be required to state in their reports the nature of the inspections carried out. This will help to avoid the same inspection being repeated by the inspector in the next port of call" (Commission of the European Communities, 2000).

The EQUASIS information system was initiated in January 2000, when the maritime administrations of France, United Kingdom, Spain, Singapore and the European Commission signed an MOU. The United States Coast Guard and the maritime administration of Japan have expressed their intention of joining as signatories. Safety related information for the database system will be supplied by Port State control authorities and relevant industry, such as classification societies (IMO, 2000a).

Another Concentrated Inspection Campaign of the Paris MOU targeted the structural safety of bulk carriers of more than 30,000 gross tons and more than 15 years old. The Deputy Secretary for the Paris MOU, Capt. Michael Voogel, believes that this type of campaign is necessary due to the increasing problem of an aging world fleet and resultant incidents from structural failures in this trade.

Deficiencies found during an inspection may result in an instruction to the master to rectify the problems before departure or may extend to detention. Costly follow-up inspections, unfavorable peer pressure and the embarrassment of a ship being listed in the monthly list of detentions issued by the Paris MOU, should result in better control of non-complying operators. (Paris MOU, 1999a; Voogel, personal interview, 1999).

The Paris MOU points to the decreasing numbers of detentions as evidence that focused Port State control is working, from an all time high of 17.6% in 1995 to 14.3% in 1998. The number of substandard ships which trade in the region is less each year (Voogel, personal interview, 1999).

Dr. Chen Tze Penn, Director-General of the Maritime and Port Authority of Singapore, emphasizes the important role of Port State control in one of the busiest ports in the world. In 1997, Singapore received the most shipping tonnage since 1986, in excess of 800 million gross tons. Singapore port serves as the focal point for 400 some shipping lines. "Port authorities contribute to enhanced safety by exercising the powers of port state control provided in international conventions. Ships are inspected in port and those found with safety deficiencies are not permitted to leave port until the deficiencies are rectified. Cooperation amongst countries on port state control has proven to be effective in enforcing safety standards on substandard ships" (INTERTANKO, 1997).

Penn's comments find support from industry about the validity of Port State control. The big trading countries, like Australia, Japan, Europe, the US, are getting better at enforcement. Where before, ship owners regarded Port State officials as the "enemy", now they are becoming industry's greatest ally to rid ship owners and those in the chain of responsibility of the poor operators. Detention lists are available on the internet, in major classification society web sites, such as Lloyd's Registry, and in industry association sites. The effect of such an open system is to put pressure on ship owners and charterers to run good ships and to enhance the power of third parties to enforce international criteria of safe shipping. Trade organizations are assisting regulators to do their job, instead of viewing authorities as yet another obstruction to getting to the business at hand. The hoped for end result is that the substandard shipper will be "homeless" (du Moulin, personal interview, 1999).

The US, as an active recipient of foreign flag vessels, has a well-refined Port State control system. Almost 8000 non-US ships arrive at US ports annually. Of those, 95% are passenger ships and 75% carry cargo (Pontiff, 1999). The US starts with the basic assumption that the Flag State has performed its job properly and that certificates issued evidence compliance with international treaties. Documents are checked to determine effective dates, expiration and issuing compliance with the basic treaties. The Port State control officer performs a cursory examination, including emergency drills as appropriate, and develops a general impression. Then, based upon that general view, the US Coast Guard officer makes certain conclusions about the operational compliance of the vessel with international and national standards. If necessary, the officer conducts an expanded scope examination, digging deeper into operational

issues, based on the "clear grounds" rule. Capt. Pontiff, former Chief of the US Coast Guard Office of Compliance interprets the basic Port State control authority for examinations as being subject to a practical Rule of Thumb for field inspectors. As long as the inspector is finding problems, he/she can continue the examination (Pontiff, personal interview, 1999).

Pontiff describes the US Coast Guard's Port State control program as a necessary "resource allocation tool". The boarding priority program was developed in response to a 1994 Congressional mandate aimed at eliminating the substandard vessel from US waters (1994 Department of Transportation Appropriations, Pub. L. No. 103-122). Under the law, the US Coast Guard was tasked with developing a system for conducting boardings, which would hold "... those most responsible for substandard ships accountable, including owners, classification societies, and flag states". The resulting program was designed to target for boarding those vessels of a higher risk than others. A matrix was created to rank vessels, helping the Port State control officers determine which of the many entering a given port should be boarded.

Any foreign vessel, greater than 300 gross tons, entering a US port must give 24 hour advance notice to the Marine Safety Office of the US Coast Guard responsible for that port (Advance Notice of Arrival, 33 C.F.R. 160.207). Based upon the information in the Marine Safety Information System, the database used by the US Coast Guard, the port can determine whether the ship is a "risky" ship, and where the vessel falls within the boarding matrix. First targeted for boarding are ships not boarded within the past year. After that, the US Coast Guard uses a point system, assigning a certain number of points to a vessel based upon these factors:

- Owner/operator—targeted are ship owners who have been detained in the US more than once in the previous 12 months;
- Flag State—targeted flags are countries with an intervention ratio higher than the average for all Flag States for vessels operating in US waters, and more than one intervention in the past 12 months;
- Classification Society—targeted is the classification society not recognized by the US Coast Guard or whose performance is below expectation due to high numbers of interventions on vessels classed by that society;
- Vessel Boarding History—targeted vessels are those detained one or more times within the past twelve months; and
- Vessel Type—points are assigned based on type. For example, 1 point is assigned for an oil/chemical tanker.

The port makes a determination about whether to examine a foreign flag vessel based upon the total accumulated points and assigns Priorities 1 through 4 to each vessel. Priority one vessels are boarded 100% of the time, while Priority four vessels are rarely boarded. The decision is made locally by the Captain of the Port. There are 45 such Captains of the Ports throughout the US Boardings of Priority 1 vessels take place prior to the vessel entering the US port, or if not possible, prior to any cargo

or fuel oil being transferred. The examination will deal first with the cargo transfer operations, so that those might be conducted while the rest of the examination takes place over a half day period, unless the examiner makes findings such that the cargo system must be shut down entirely.

Under US Port State control authority, one of several outcomes may result:

- Detention until a technical, operational or safety matter is satisfactorily resolved. The challenge occurs when a safety management system is not in place as required by the ISM Code. Then, the classification society charged with conducting the audit may, when contacted by the Flag Administration for the vessel, actually conduct training on the ship while it sits at the dock until the master and crew are properly oriented and trained.
- Targeting of a ship in the future for boarding each time it calls at a US port with the attendant delays that creates.
- Contact of the Flag Administration for convention violations, which may lead, in the case of ISM Code violations, to a complete audit of the company's Document of Compliance and loss of the right to conduct trade.
- The stigma of being listed in various databases as a detained vessel.
- Penalty provisions, such as Section 408 of the Coast Guard Authorization Act of 1998 which prohibits a detained vessel, determined to be substandard, from transporting Government-impelled cargo, for violation of an international convention of which the US is a ratifying Party (48 USC Section 2302(e)(1)(A).

Two Navigation and Vessel Inspection Circulars (NVICs) act as guidelines for Port State control inspectors, NVIC 3-98 for STCW 95 compliance and NVIC 4-98 for ISM Code. Additionally, several chapters of Vol. 2 of the US Marine Safety Manual apply to Port State control of foreign flag vessels (US Coast Guard, Website, PSC, 1999). Decisions of the US Coast Guard inspection officer may be appealed to the Captain of the Port, then the District Commander, and finally, to national headquarters, to Pontiff's Office of Compliance (33 CFR 160.7) (Pontiff, personal interview, 1999; Sahatjian, 1999; NVIC 4-98).

International detentions follow much the same rules as the US system. For example, under the Paris MOU, guiding principles for deficiencies found during inspections are:

- "Master instructed to rectify deficiency before departure";
- Ship detained and if the deficiency is "hazardous to safety, health, and the environment", the hazard must be rectified before the vessel leaves;
- Flag State informed;
- Vessel prohibited from performing an operation;
- Where the rectification cannot take place in the port where found, then the ship may sail to another port if this is not a hazard to safety of the environment; and

- All costs accrued by the Port State control officers due to suspended inspections are paid by the ship owner/operator before he leaves that port (Secretariat PMOU, 1996).

The most significant challenge to effective Port State control is the shipping community's acknowledgment that Port State control is here to stay and that Port State control is an effective part of the overall system of safety and pollution prevention. The next major step is to quantify how well the targeting system is working in reducing substandard shipping, much like the work being performed by the Paris MOU. The Coast Guard Authorization Act of 1998 required the US Coast Guard to report back to Congress about the effectiveness of implementation. Analysis indicated declining detention rates and higher compliance. The third area of focus will be coordination with international databases, information sharing with the Paris MOU so that all databases become interconnected. Vessels detained under the Paris MOU are entered in the Marine Safety Information System as a "vessel of particular interest", which provides yet another piece to the matrix puzzle.

Like the finding by the Paris MOU that detentions are declining, US figures show that Port State control is working in the US:

- Declines in 1998 in the number of detentions, with a 32% drop from 1997; and
- A decreasing number of vessels detained attributable to class—35% in 1995, 23% in 1997, and down to 14% in 1998. This is due in part to the working partnership and ongoing communication between the classification societies and the US Coast Guard (Pontiff, 1999).

In the international community, Port State control is regarded as the "teeth" needed to close the gaps in the safety nets and bring the "cluster of actors in shipping" into the new era. Fernando Plaza, Senior Deputy Director at IMO, summarizes the work ahead for the industry:

> "The best way ahead seems to be, however, to continue the process already started by increased control in the various regions and strive for a better and more efficient implementation by the States (acting as Flag States) on their own ships rather than as a port State acting on foreign flag ships. Effective regional agreements, common criteria for inspections; harmonized inspection and detention procedures; internationally approved qualification of control officers; an internationally applied Code of Conduct; transparency through increased information within regions and inter-regionally are the answers as port State control is here to stay" (Plaza, 1998).

Active adoption and pursuit of the safety culture by each of the players is the foundation for the global vision expressed by Plaza and other leaders involved in the extensive web of maritime transport of oil. Each member of the three chains, of responsibility, quality and image, cooperating together can make the safety nets function so that the business of transporting oil across the oceans remains truly viable.

4.2. Regulation of Oil Spills—Control By International Conventions

The International Maritime Organization (IMO) has become the forum for the implementation of international conventions related to oil spills and response has been increasing control over the shipping and oil industry. Historically, international law governing vessel-source oil pollution has been hampered by jurisdictional issues, slow maturing of technological innovations, and a less than active role of maritime states in preventing pollution. This short-sighted focus has changed in recent years due to an unfortunate series of international oil spills. Over time the increased consciousness of the maritime countries has led to a well developed body of international law for vessel-source oil pollution conventions. In the 50+ years of its existence, IMO initiatives have created these important international conventions amongst others:

- International Convention for the Prevention of Pollution from Ships, 1973, adopted by IMO conference from 8 October to 2 November 1993 (MARPOL); as modified by the Protocol of 1978. The Convention as modified is know in short form as MARPOL 73/78;



On 26 November 1997, the M/V *Kuroshima*, a 368-foot frozen seafood freighter, broke away from its anchorage during a severe storm and ran aground at Summer Bay on the Aleutian island of Unalaska spilling an estimated 39,000 gallons of Bunker C fuel oil.

- International Convention for the Safety of Life at Sea, 1974 (SOLAS) and Protocol of 1978, Protocol of 1988; 1994 amendments thereto introducing Chapter IX, the ISM Code (discussion Section 3.5);
- International Convention on Oil Pollution Preparedness, Response & Cooperation, adopted November 1990 (OPRC); (See Section 2.4)
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, adopted July 1978 (STCW) as changed significantly by the 1995 amendments (STCW 95); and
- International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, adopted 29 November 1969 (Intervention Convention).

MARPOL 73/78 and SOLAS are "umbrella documents that set out purpose, intent, and the desired performance in the ship safety and pollution prevention arenas". Their chief function is to regulate ship design for safety and pollution prevention. SOLAS is directed toward ensuring safety of all parts of the marine transportation industry, crew, ports, passengers, ships and their cargo, with inevitable, but indirect impact on the environment. MARPOL 73/78 seeks directly to prevent pollution from accidents and normal operations of the vessel and does this by specifying design, equipment and procedural requirements to prevent pollution from oil and other substances (Lemley, 1999; Guruswamy, 1998).

While these conventions address more technological-oriented concerns, STCW 95 focuses on training and competence of crew, as well as safe manning. OPRC works toward the harmonization and coordination between countries to prepare for and respond to oil spills in regions throughout the world. The Intervention Convention provides for specific control over a threat or actual spill affecting the marine environment or related coastal interests. Together, these and the many other IMO conventions establish the underlying body of law regulating pollution caused by maritime trade on the oceans. The Flag Administrations pass their own enabling national legislation, which laws and regulations are then implemented by the other parties in the "Chain of Responsibility".

4.2.1. MARPOL 73/78

The International Convention for the Prevention of Pollution from Ships, 1973, and its 1978 Protocol, which absorbed the parent convention, are referred to collectively as MARPOL 73/78. This convention is regarded as one of the most important of the IMO conventions on the subject of marine pollution. MARPOL 73/78 sets out a direct scheme for preventing pollution from oil and other substances, caused by normal operational discharges and by accidents. The goal of MARPOL 73/78 is "... the complete elimination of intentional pollution of the marine environment by oil and other harmful substances and the minimization of accidental discharge of such substances" (Preamble to MARPOL 73/78).

Because of the concrete design terms of the convention, a MARPOL vessel represents the standard against which further design changes are to be measured (Guruswamy, 1994). Regulations 13 (F, G) of Annex I contain the requirements for retrofitting tankers to double hulls or alternative structural or operational arrangements of at least the same level of protection.

The Regulations concerning various sources of ship generated pollution (oils, chemicals—noxious liquids, certain types of waste, and most recently in 1997, air pollution from ships) are contained in six Annexes, Annex I being the Regulations for the Prevention of Pollution by Oil. As of 1998, there were 104 Parties to the convention, representing a little more than 93% of the world's tonnage. MARPOL 73/78 essentially replaced its predecessor, the International Convention for the Prevention of Pollution of the Sea by Oil, 1954. MARPOL 73/78 entered into force in October 1983. IMO is considering a seventh Annex to extend the scope of prevention even further into the area of harmful aquatic organisms into new areas of the ocean through release of ballast water. The need for Annex VII is real. Estimates are that about 10 billion tonnes of ballast water, containing invasive, aquatic organisms, are transferred to the marine environment each year (IMO, 1998, and IMO, 1998). Another alternative may be an entirely separate convention on ballast water management to be determined by a conference (MEPC, 1999). Progress is being made in addressing this serious problem. Draft legal regulations, for ballast water management, have been prepared by IMO's Marine Environment Protection Committee (MEPC), although there are still a number of open items to be considered. (IMO, 2000c).

The 1978 Protocol and its amendments contributed substantial improvements to pollution prevention. MARPOL 73/78 provisions are discussed throughout this book, but a few of the more significant as they relate to oil pollution included in Annex I are these:

- New methods for washing oil cargo tanks;
- Limits on the size of cargo tanks;
- Mandated use of inert gas systems to cut down the danger of explosions;
- Mandated *double hull* or an approved alternative design with a phase-in program for existing tankers, by 1992 amendment. Double hulls and bottoms are mandatory for new tankers of 600 deadweight contracted for after 6 July 1993, or keels laid after 6 January 1994, or delivered after 6 July 1996 and for oil tankers of 5000 dwt and above (Regulation 13F). Alternative designs, such as the "mid-deck" design, are permitted so long as they provide the same level of protection. Regulation 13G addresses existing crude oil carriers, meeting the requirements of new oil tankers and existing product carriers of 30,000 dwt. Ships built to MARPOL standards must comply no later than 30 years from date of delivery and Pre-MARPOL, no later than 25 years from date of delivery must have side or bottom protection for at least 30% of the cargo area;
- Designation of the north-west European waters as a "special area", like the Mediterranean Sea, the Baltic Sea, the Red Sea, the Gulfs area, the Gulf of Aden and

the Antarctic area, each of which is a special area, due to oceanographical and ecological conditions. Discharge of oil or oily mixtures from any tanker or ship over 400 gross tons is prohibited in such areas by adoption of a 1997 amendment (Regulation 10);

- Creation of an enhanced program of inspection to apply to all oil tankers 5 years and older, which survey will concentrate on hull and key structural elements. Given the average age of tankers, approximately 15 years, the intention behind the enhanced survey is to find corrosion, fractures, stress caused by structural deterioration. This inspection process will apply to more than 80% of existing tankers. IMO issued guidelines implementing this program, Resolution A.744(18);
- Requirement of a shipboard oil pollution emergency plan approved by the Flag Administration, in accordance with IMO guidelines. The 1991 Amendment mandates that the plan lists contact authorities, describes the emergency action to be taken, and designates the person to be contacted for coordination of shipboard activities with regulatory authorities (Regulation 26). (For more information, see Section 2.4 of this book.); and
- Enlargement of the role of Port State Control officers, giving them the right of inspection for operational, and not just technical, compliance with international conventions and national regulations by 1994 Amendments, "... where there are clear grounds for believing that the master or crew are not familiar with essential shipboard procedures elating to the prevention of pollution by oil" (Regulation 8A) (IMO, 1995a, 1997a, 1998b).

It is in the area of increased Port State Control that MARPOL 73/78 reveals its effectiveness. Article 6(2) of MARPOL 73/78 allows inspection and verification by a Port State to determine if a ship has discharged any harmful substances, requires report of such a violation to the Flag State, and places the onus on the Flag State to cause proceedings to be taken and to impose penalties under its national law sufficient to "discourage violations" of the convention (Article 4(3)). (For further discussion, see Section 4.1.5 on Port State Control of this book.) Taken as a whole, the convention requirements of MARPOL 73/78 directly influence the safety of shipping today.

4.2.2. SOLAS

The International Convention for the Safety of Life at Sea (SOLAS) is considered the most important of all the international conventions dealing with maritime safety, and indirectly, the prevention of oil pollution and vessel impact on the environment. The overall objective of SOLAS is to assure that the crew, ports visited by the ship, passengers, the cargo and the ship itself are safe. SOLAS and implementing Flag State regulations control ship design, shipyard standards, and third party criteria for how to build and operate a ship.

Following the sinking of the *Titanic*, an international conference was held resulting in the first SOLAS convention, but, unfortunately due to World War I, it did not come

into force. A second conference was held in 1929, resulting in the 1929 SOLAS convention. In 1960 during IMO's first international conference, the 1960 Convention replaced the 1948 version. Again, in 1974 a new Convention was adopted to replace the 1960 convention. SOLAS covers a wide range of measures to improve safe shipping: subdivision and stability; machinery and electrical installations; fire protection, detection and extinction; life-saving appliances; radio; safety of navigation; cargo carriage, including dangerous goods, and nuclear ships. The new Convention entered into force on 25 May 1980 and serves as the basic document for enforcement today, along with:

- Two major amendments by means of Protocols: 1978 SOLAS Protocol, in force as of 1 May 1981 and the International Conference on the Harmonized System of Survey and Certification, the 1988 SOLAS Protocol
- Amendments by means of IMO resolutions either by resolution adopted by the Marine Safety Committee or by Conference of the Contracting Parties, or through the 1974 SOLAS "tacit acceptance" provision of article VIII. Tacit acceptance allows an amendment to enter into force on a date specified (within 18 months to 2 years after adoption) unless one-third of the Contracting Parties or Contracting Parties with combined fleets of 50% of world tonnage specifically reject the amendment. This was an important innovation by SOLAS to avoid the formerly cumbersome and protracted IMO amendment process.
- Chapter IX of SOLAS, Management for the Safe Operation of Ships, adopted as part of the May 1994 amendments and effective as of 1 July 1998 contains the ISM Code. For further discussion see Section 3.5 of this book (IMO, 1998d, 1999b).

There are 138 Contracting Parties to SOLAS, representing more than 98.36% of world tonnage. For purposes of marine safety and prevention of oil pollution, SOLAS chapters of the Consolidated text in the annex to SOLAS 1974 and the 1978 Protocol break down into these areas of coverage:

- Chapter I—General Provisions;
- Chapter II-1—Construction: Subdivision, stability, machinery, electrical installations;
- Chapter II-2—Construction: Fire protection, detection and extinction;
- Chapter III—Life-saving appliances and arrangements;
- Chapter IV—Radiocommunications;
- Chapter V—Safety of navigation;
- Chapter IX—ISM Code;
- Chapter X—Safety measures for high speed craft; and
- Chapter XI—Special measures to enhance maritime safety (SOLAS, Consolidated Edition, 1997).

Important amendments to SOLAS have mirrored advancing technology, the increasing concerns of the maritime community for the role of the human element in ship operation and safety, and the need to control substandard operators. Various sections of this book refer to SOLAS as it applies to these goals. The following list includes a highlight of significant amendments:

- 1988 Amendments—Introduced the global maritime distress and safety systems (GMDSS), believed to be the greatest advance in maritime communications since radio (effective 1 February 1999) and introduced the 1988 Protocol with its harmonized survey and certification system.
- GMDSS requires all passenger ships and all cargo ships over 300 gross tonnage on international voyages to carry satellite and radio-communication equipment, for sending and receiving distress alerts and communicating with others general and safety information. IMO believes that with GMDSS " . . . no ship in distress can disappear without a trace and that more lives can be saved at sea" (IMO, 1999).
- 1994 Amendments—During the Conference of Contracting Parties, added three new chapters to SOLAS: IX—the ISM Code; new Chapter X—a mandatory Code of Safety for High-Speed Craft; Chapter XI—special safety measures, which include the recognition of organizations entrusted by Flag Administrations to carry out surveys and inspections, provides for enhanced surveys for SOLAS requirements, and gives Port State Control officers augmented inspection authority "when there are clear grounds for believing that the master or crew are not familiar with essential shipboard procedures relating to the safety of ships". (For further discussion, see Section 4.1.5 of this book.)
- 1994 Amendments—Substantial changes to Chapter II-2 to the fire protection section, to make this section more user friendly and to incorporate substantial changes which resulted due to serious fire casualties.
- 1996 Amendments—Revised Chapter III with a new International Life-Saving Appliance Code which became mandatory in July1998, as a result of major accidents in the 1980s and 1990s affecting passenger ships, and to accommodate technological improvements.
- 1998 Amendments—Regulation adopted requiring Contracting Parties to have in place suitable arrangements to register GMDSS ship's call sign and Inmarsat identities, and coordinate rescue operations (IMO, 1995, 1996a, 1998b, 1998e).

Implementation of the SOLAS treaty requires the interrelation of each of the players creating the safety nets around the vessel:

- **Ship owner/Third Party Association Standards:** Ship owners have a primary responsibility to crew, operate and maintain their ships in compliance with their corporate quality standards, national and international rules and regulations and classification society requirements. Industry consensus standards set the rules

for ship construction and operation in all areas, such as construction materials, pressure vessels, equipment specifications and many others. These standards supplement those produced by IMO and the national regulatory bodies.

- **Flag States:** Governments are obligated to have maritime organizations issue the rules and oversee operation for compliance for those ships that fly their flag. Vessels that comply with these international treaties are issued "certificates" by their government attesting to compliance and these certificates permit vessels to trade in foreign ports and not be subject to ship design, operations laws, and rules of the Port State. There are important exceptions to Flag State control. OPA 90 and certain international treaties provide significant Port State control. For further discussion, see Section 4.1.5 of this book. While SOLAS sets forth the general requirements in each of several areas for safe operation of a ship, it is the job of the Flag Administration to specify more detailed standards.
- **Classification Societies:** SOLAS, like MARPOL 73/78 (see discussion Section 4.2.1) requires that vessels are in class with a "recognized" ship classification society to receive SOLAS certification. The classification societies can act on behalf of the Flag Administration in enforcing regulation, and particularly, in the case of SOLAS inspections, assure that ships are designed, constructed and maintained in compliance with structural/operational requirements and with the detailed technological standards of the class rules (June 1996 amendment to Chapter II-1; IMO, 1996).
- **Insurers/P&I Clubs:** Coverage depends upon the ship being classed with a recognized classification society during the period of insurance and with the owner complying with all statutory requirements of the ship's flag relating to construction, condition, equipment and manning, as evidenced by valid treaty certificates and actual operation (UK P&I Club, 1999 Rules, Rule 5K).
- **Port States:** Recognizing that ships may have problems during operation which could render them not in compliance since their last Flag State inspection, and recognizing the principle that a Port State has a right to be assured that international trading ships in their waters are in compliance with conventions, SOLAS has provisions that allow the Port State to board vessels and complete a review/inspection to assure their compliance. Port States can use the SOLAS requirements to detain or otherwise protect against the entry into their ports of substandard ships, not meeting the treaty requirements.
- **Mariners:** Mariners have a basic responsibility to perform their assigned duties in a professional, seamanlike manner, upgrading their training and skills as needed and familiarizing themselves with the particulars of the ship (Guruswamy, 1994; Lemley, 1999, personal communication, 1999).

The importance of this interrelationship of SOLAS and links in the chain of responsibility is that the treaty becomes yet another tool in the arsenal of the shipping community to eliminate substandard shipping or reform standards of such shippers

and to create high quality in shipping. "Explicitly including 'class' as a SOLAS requirement enables flag States and port States to also enforce the detailed industry standards embodied in the class rules. This is a very strong hammer in eliminating substandard ships in that port States can identify problems with class compliance and class societies have greater ability to get substandard ship operators to comply with class rules" (Lemley, 1999).

4.2.3. STCW

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) 1978, is the international treaty designed to provide officer and crew standards for seafarers. In force for much of the world fleet as of 1984, it was not ratified by the US until 1991, and became fully effective for US flag ships as of 1 October 1996. For many important reasons, in 1995, IMO amended the Annex to the 78 Convention, with some far reaching revisions, which amendment is called STCW 95, and which came into force 1 February 1997. The reasons behind adoption of STCW 95 emphasize the evolving nature of international conventions, which adapt to changes in circumstances dictated by technological improvements over time and the increasing concern over the impact of the human element on incidents. The chief criticisms concerning STCW 78 were lack of consistency of standards and enforcement provisions, need to address important improvements in technology, such as simulator training, automatic radar piloting aids, modern bridge procedures, use of a Quality Assurance system, and the shifting focus on human factors.

The main goals of STCW 95, in response to each of these areas of criticism, are:

- To detail technical requirements to an associated STCW Code, parts A and B of the amendments to the Annex;
- To clarify the standards of competency required at different levels of seamanship. For example, as a basic concept, STCW 78 did not define "competency";
- To provide effective mechanisms for enforcement of its provisions, by among other means, requiring Flag Administrations to control and endorse qualifications of personnel authorized to serve on their ships;
- To make parties accountable to each other, through IMO, for purposes of implementing the Convention; and
- To offer greater flexibility in assignment of functions on board ship, by introducing alternative certification for increased mobility in different shipboard disciplines, the "functional approach" (IMO, 1997d; Houston, 1996).

STCW applies to 133 Parties to the Convention, representing more than 95% of the world's fleet. The effective date was 1 February 1997 for many of the provisions, with a 5-year transition period for the balance, so that ultimate compliance is due by February 2002. Certificates issued to seafarers before 1 August 1998 are valid until the year 2002. Those new mariners entering training after 1 August 1998 must comply

fully with STCW 95 (IMO, 1997d, Schrinner, 1997). The Convention applies to all commercial vessels on waters outside the boundary line (which essentially separate the bays, harbors and other inland waters from the oceans), including tankers, escort tugs and escort response vessels. In the US, mariners on uninspected passenger vessel, certain fishing vessels, barges and vessels operating only on the Great Lakes are exempted and mariners on seagoing ships of less than 200 gross tons are assumed to be in compliance with STCW 95 (Sahatjian, 1997). The revised Convention has eight chapters, which contain the basic requirements. Chapters I through IV deal with the general provisions, master and deck department, engine department, radio communication and personnel. Chapter V covers special training on ships such as tankers and ro-ro ships. Chapter VI handles emergencies, occupational safety, medical care and survival training. Chapter VII deals with alternative certification. Chapter VIII details watchkeeping measures, such as those introduced to prevent fatigue, a significant cause of incidents, estimated as the factor in 16% of critical vessel casualties and 33% of personal injuries (ITF, 1999).

To clarify the standards of competence, STCW 95 added a detailed STCW Code to the regulations in the annex in two parts. This Code sets objective standards of competency, outlines practical examination methods, and defines measurement tools for assessors of seafarer competence. The mandatory technical standards are contained in Part A. Part B of the STCW Code is not mandatory, but it serves the important function of providing guidance to assist those involved in educating, training and assessing the competence of seafarers. Part B helps make more uniform the application of STCW requirements. Together STCW 78 and 95 establish the legal framework within which the required technical standards of Part A of the STCW Code are applied (IMO, 1997d, 1999b).

In the area of enforcement, STCW 95 impacts the "safety net" in a profound way. STCW affects four levels:

- The labor supply country—the seafarer's home country must train, examine, and if found competent, certificate the seafarer;
- The Flag State—the country registering the ship on which the seafarer sails is responsible for certifying that the seafarer's country issued a certificate in compliance with the convention;
- The company—the employer of the seafarer must employ competent people; and
- The Port State—the country in which the vessel visits must check the certifications and determine that the ship is properly manned by seafarers complying with the convention (Smith, 1997).

STCW 95 requires the labor supply country to submit evidence that its training facilities and examination systems comply with the Convention. The country must have a *quality standards system* in place "... all training, assessment of competence, certification, endorsement and revalidation activities carried out by non-governmental agencies or entities under its authority are continuously monitored through a quality

standards system to ensure the achievement of defined objectives, including those concerning the qualifications and experience of instructors and assessors; and ... where governmental agencies or entities perform such activities, there shall be a quality standards system".

For the first time, International Maritime Organization (IMO) is assuming an oversight role in the area of enforcement of standards. Parties to the convention must submit to IMO information concerning administrative measures adopted to ensure compliance, education and training courses, certification and other requirements of the convention. The Safety Committee of IMO, its senior technical body, will designate competent persons to serve on reviewing panels. These reviewers will report to the Safety Committee about whether the submitting Party has given full and complete effect to the Convention. If the committee agrees with the report, they will include that Party's name on the so called IMO *White List*, the official list of all Parties who meet the minimum requirements of STCW. IMO has the authority to check on implementation standards of parties to its conventions (IMO, 1997). The time line for this procedure is already in effect:

- 1 August 1998—Parties submitted the required compliance information to IMO (82 of the 133 countries submitted timely information as of 1 August 1998). Since that date, 12 others have submitted their information;
- Early Spring 2000—Review conducted by competent persons, who are to report to Marine Safety Committee. Five panels completed work and reported, 30 completed initial evaluation, and 47 are still engaged in initial evaluation as of January 1999;
- Late Spring 2000—Safety Committee to review reports and issue "White List"; and
- 1 February 2002—All seafarers to be trained in compliance with new standards, must carry certificates with STCW 95 endorsement (IMO, 1998a, 1999b; Young, personal interview, personal communication, 1999).

"Other Parties are entitled to accept certificates issued by or on behalf of parties on the White List as being in compliance with the Convention" (Houston, 1996). While the Convention was carefully drafted not to imply the existence of a "Black List", the Secretary-General of IMO has outlined what may befall those countries whose names do not appear on the "White List": "Following the publication of the list, certificates issued by countries not included in the list will not be accepted as prima facie evidence that the holders have been trained and meet the standards of competency required by the Convention. The consequence of this will be that ships on which such seafarers are sailing may suffer costly delays in ports while inspectors verify that they are competent to safely man the ships and this may in turn lead to unwillingness of foreign ships to employ such seafarers. Incidents of this kind will eventually reflect badly on countries concerned" (IMO, 1997d).

Flag States must ensure that seafarers onboard vessels are qualified for their emergency and regular duties and must "... confirm that the training and examination systems in the country which issued the original document are fully in accordance with the revised Convention before they can issue a flag state certificate" (Smith, 1997).

Port States have an expanded range of control mechanisms for enforcement of the new standards. Port State Control officers will check not only the seafarer's national certificate, but also now the Flag State endorsement and that the number of certificates on board match the Flag State's Safe Manning Certificate. Under STCW 78, a Port State officer needed "clear grounds" in order to assess a seafarer's ability on board a visiting ship. This authority has expanded substantially, so that a Port State officer can undertake such an assessment whenever a ship is deemed as "being operated in such a manner as to pose a threat to persons, property or the environment" (Smith, 1997).

Finally, in the area of enforcement, STCW, along with the ISM Code, (see Section 3.5 for discussion) has created a crucial nexus between owner and seafarerOwners now have legislated responsibility to ensure that their employees can conduct their business safely in terms of protecting human life and the environment. The company, along with its Masters and crew, is responsible for complying with the Convention. To ensure this, companies must provide written instructions to every newly employed crew member so that crewman can become familiar with all aspects of the job. Section A, Regulation I/14 has five separate sections delineating this duty:

- The operator shall ensure each seafarer holds the appropriate certificate, issued by the administration in compliance with the Convention;
- The ship must be manned in compliance with the safe manning certificate;
- Documentation and data evidencing experience, training, medical fitness and competency must be readily available for each seafarer on board;
- Seafarers must be familiar with the ship and emergency procedures, including safety procedures and equipment they will use; and
- The crew must be able to effectively coordinate activities in an emergency and perform vital safety and pollution prevention functions (Smith, 1997; Houston, 1996).

It is in the area of training of mariners and demonstration of their competency that STCW 95 has effected the greatest change. No longer will the old "hawsepipe method" work, in which the seafarer passed a physical test, acquired sufficient sea time by coming up through the ranks, and then crammed for and passed a written exam. The focus of STCW 95 is firmly upon demonstrating a degree of understanding and skill in performing competencies, not just in passing a final exam. The training process takes the mariner from "cradle to grave" and is not just training for a one time event, an exam (Szczurek, 1999).

Competency is the subject of tables in Part A, which detail for various sizes of vessels, depending upon their onshore or ocean operational areas, and the size of their

main propulsion machinery, the knowledge, understanding and proficiency for levels a seafarer must possess, methods for demonstrating that competency, and criteria for evaluating the skills demonstrated. The levels are:

- Management—masters, chief mates, chief engineers and second officers;
- Operations—officers in charge of navigation watch or engineering watch; and
- Support—seafarers forming a part of navigational or engineering watch.

For Parties attempting to comply with STCW 95, these descriptions of competence are general only, leaving the Contracting Parties to work out the details (Houston, 1996).

STCW 95 imposes requirements that seafarers have *basic-safety training* in:

- Firefighting;
- Elementary first aid;
- Personal survival techniques—lifejacket, liferaft use; and
- Personal safety and social responsibilities,

and specific shipboard *familiarization training*:

- Including personal survival techniques—person overboard, smoke detection, emergency routes, medical emergency equipment use, etc; and
- For seafarers on tankers and passengers ships, special familiarization with cargo and cargo equipment (Sheetz, 1999; Houston, 1996).

Quantity of sea service has been enhanced by quality of such service. Training must be by one of several approved methods and recorded in a *training record book* for licensed personnel at the "officer in charge" level:

- "Approved in-service experience;
- Approved training ship experience;
- Approved simulator training, where appropriate; and
- Approved laboratory equipment training" (Houston, 1996).

STCW 95 introduces qualification requirements for trainers and assessors, for any person conducting in-service training of a seafarer, onshore or at sea, where such training will be used to qualify for certification. The Trainer/Assessor must understand the training objectives, be competent to train, have the appropriate level of knowledge, have received the necessary guidance for assessment procedures, including the use of simulators where appropriate, and have the necessary practical experience. How one qualifies to become an assessor or trainer differs between countries (Houston, 1996).

Finally, but of great importance, STCW 95, Chapter VIII deals with the question of fatigue and safeguarding seafarers from human error caused by fatigue. For all seagoing vessels, for officers in charge of a watch and the ratings forming part of the watch, whether at sea, in port, or at anchor, each must have a minimum 10 hours of

rest in a 24-hour period, broken into no more than two periods, one of which is at least 6 hours. There are some exceptions for emergencies. The owner/master must ensure that minimum rest periods are enforced (Sheetz, 1999).

4.2.4. STCW 95—The Future

"The devil is in the details" (Szczurek, personal interview, 1999). This adage most aptly states the sentiments of those in the field internationally and in the US who raise questions about how STCW will be implemented and whether the revisions to the Convention will achieve their stated objectives of producing competent, qualified mariners and thus reduce risk of loss of life and environmental damage.

In the US, the US Coast Guard is charged with implementing STCW 95. The Coast Guard published an interim rule in the Federal Register, which is still in force, on 26 June 1997 (46 C.F.R. Parts 10, l2, 15). Other important operational guidelines are found in US Coast Guard Navigation and Vessel Inspection Circulars (NVICs) and in the National Maritime Center Policy letters. Amongst many, certain important NVICs include: 10-99—interpretations of SOLAS Ch. II-2, 5-99—guidance for voluntary compliance with ISM Code, 3-99—GMDSS equipment requirements, 1-99—refresher course, 7-98—standard marine communication phrases, 3-98—Port State control, 2-98—physical evaluation guidelines, 8-97—issuance of new documents, 7-97—quality standards system, 6-97—qualifications on instructors, 5-97—training records books, 4-97—company responsibilities.

The increased authority under STCW 95 provides the right of control officers to detain ships. In the US, the US Coast Guard takes this authority seriously, views compliance with STCW critically and will hold ship owners and operators responsible for non-compliance. Vessels will be detained. Foreign flag ships with STCW violations will be placed upon a "target" list and assigned points, subjecting them to increasing numbers of boardings when a company's vessels have been detained twice in 1 year (Sahatjian, 1999). (See Section 4.1.5 of this book for discussion of Port State Control.)

During boardings and inspections, certain of the new requirements of STCW 95 may give rise to Port State Control action. Many of the new standards may be phased in a 5-year period. Violations of others may be enforced immediately. As to the "fitness for duty" or fatigue issue, Port State Control officers will be reviewing posted watch schedules to determine if the watchkeeping personnel are maintaining the required 10 hours of rest. Failure to comply with this rule will lead to US officers and other Port State Control officers detaining the vessel until the deficiency is corrected. If during a Port State Control boarding, including conducting of operational drills under SOLAS Chapter XI (see Section 4.2.2 of this book for further discussion of SOLAS), it is clear that members of the crew cannot perform their assigned duties, the officer may determine that the vessel is being operated in a manner posing a danger to

persons or the environment. This determination may be another grounds for detention and other Port State Control actions (Schrinner, 1997).

Because of the problems associated with Flag State implementation of STCW 95, US enforcement of the convention for its own and foreign flag vessels is critical to the convention's full implementation.

> "Everyone's ships come through US waters at some point. If the US Coast Guard has sufficient resources to conduct proper inspections of mariner competence and enforces STCW strictly, in cooperation with European Port State Control, enforcement of the spirit of STCW will drive up world wide consciousness" (Kincaid, personal interview, 1999).

Enforcement is where the "rubber meets the road". "Port States will be the STCW 95 keepers of the Convention" (Compton, personal interview, 1999).

People in the field working with STCW 95 at all levels, from the highest regulatory authority to the training school, company, and seafarers unions, support STCW 95 as important for advancing the quality of seamanship. STCW 95 will accomplish significant, much needed objectives. The Convention amendments:

- Establish an international minimum standard of qualifications for mariners at all levels;
- Cause the parties to put into written terms, standards and procedures needed to implement a quality standards system, which practices existed previously in a less formal fashion;
- Create a mechanism for communicating the steps and measures to give the convention "full and complete" effect to the highest authority, the Secretary General of the IMO. This communication is a major plank of the convention;
- Begin to level the playing field between countries, because parties must invest money in education and training so that their seafarers meet at least "minimum levels" of qualification;
- Modernize requirements and place responsibility on companies to ensure that their ships are properly manned with qualified persons;
- Move the shipping industry toward competence (Winbow, personal interview, 1999);
- Standardize qualifications so that those going to sea have the knowledge they need when they walk up the gangway to perform their job at sea;
- Set bars which people must cross to move up to the next higher level, from basic safety training to the highest officer/management training (Kincaid, personal interview, 1999); and
- Provide a package of overlapping controls involving certificate issuing states, Flag States (which may be different from certificate issuing states) and the shipping companies themselves.

In addition to governments having to make submissions to IMO for placement on the "White List", Flag States are required to make some form of check on foreign certificate issuing countries to ensure that they meet STCW requirements. Also, Flag States must carry out individual checks on the qualifications of foreign seafarers. All governments must maintain records of the certificates and recognition endorsements they issue. Every 5 years, governments will send to IMO independent quality standards reports of their training and certification systems. This package of controls is intended to ensure that all seafarers will be competent regardless of the country, which issued their certificates (Bennett, personal interview, 1999).

Furthermore, the Convention amendments will:

- Provide a measuring stick to be used by outside evaluators of a nation's quality standards system, which leads to a determination by a third party that a country is doing what its paper system says it is;
- Generally raise the standard for quality performance in each country. For e.g., in the US instead of multiple choice exams being available to seafarers on the Internet, the new system requires a more formalized demonstration of skills judged by a qualified examiner (Compton, personal interview, 1999); and
- Spell out what mariners do to demonstrate competency, from entry level to those officers who have already acquired sufficient competency and experience over years (Whitlow, personal communication, 1999).

As with any new treaty, there are "growing pains" and "kinks" in the system which must be resolved in order for STCW 95 to function as intended and to reach the above anticipated good goals. Several challenges emerge for the effective implementation of STCW 95. These can be grouped into five general categories:

- Uniform interpretation and application of general terms defining minimum international standards;
- Proper application of assessment criteria for measuring individual competency;
- Enforcement by those in the chain of responsibility so that there is a functioning and not just a paper quality standards system for each Flag administration on the "White List";
- Cost of compliance for the individual seafarer to meet the initial or renewal qualifications and investment by Parties to the convention such that implementation of STCW requirements places mariner countries on an equal playing field; and
- Perceived exacerbation by the Convention of an already existing shortage of qualified seafarers at the officer and managerial levels.

A sampling of comments from around the world repeats these concerns in varying degrees, with some solutions emerging. Chris Young is one of the Marine Transportation Specialists for the US Coast Guard and Chair of IMO's Sub-Committee on

Standards of Training and Watchkeeping (STW). Young views the biggest challenge of STCW 95 as being translation by the Parties of the now, very generic, wording of the Convention into specific terms.

The concerns of those in the field center upon five general areas: uniform interpretation, proper application of assessment criteria, enforcement, cost of application, and qualified seafarer shortage. These areas are discussed in the following paragraphs:

Uniform interpretation

- What will performance measures ultimately be?—For example, in the case of the requirement of being able to reckon by "celestial bodies", what skills must be demonstrated, what will be considered acceptable error? Given that much of the competency wording is broad and open to interpretation, the Parties will need to set sufficient definition in order to establish a uniform standard.
- Who will be the assessors and what qualifications will they need to demonstrate competence to assess seafarer competency, and by what set of uniform standards? Will any qualified ship's officer meet the requirements or will there be a need for specialized training?

In countries where there are not so many training institutions, as there are in the US, this may be a stumbling block to implementation. In the US several applications have been made for certification as a "designated examiner". The Coast Guard provides oversight for training and has identified four other services, including classification societies, which may exercise oversight for the required quality standards systems and approved training providers. The US Coast Guard's Merchant Marine Personnel Advisory Committee is setting up panels to address this issue. Still to be developed are standards for approved instructors, approved assessors, and the performance measures they are to use in evaluating mariners.

- Will STCW 95 create a level playing field? This answer depends upon whether or not the interpreting countries apply a moderate view of general wording or a "too relaxed" view. For e.g., rest hour provisions dealing with the all-important issue of fatigue allow for an exception of the hours worked within a 24-hour period of "overriding operational conditions" (STCW 95, Section A-VIII/1(3)). This is not a well-defined term and abuse could occur if a Party applies a lax interpretation of this term (Young, personal interview, 1999, personal communication, 1999).

Proper application of assessment criteria

Dr. William Eisenhardt, Provost of the Maine Maritime Academy, one of such maritime academies in the US, regards the STCW 95 amendments as being a reorganization of what already exists in good training academies, i.e., putting into a quality system format the good training courses which are already in place. He emphasizes similar problem areas identified by Chris Young: to what level will students in his

academy and others need to demonstrate proficiency in front of a person trained to witness their skills, based upon uniform performance criteria to assess their proficiency, and who is qualified to sign their training record books? How detailed will the assessment criteria need to be? For the classes in academies today, Eisenhardt bemoans the fact that the minimum assessment standards for licensing are still not in place and questions whether those graduating will receive their STCW 95 Certificate in the year 2002, if the current pace of development continues.

A specific problem area focuses on the successful demonstration of practical skills learned or practiced on board a dedicated training ship or on a ship engaged in trade. In the US, those teaching at maritime academies have been designated as meeting training/assessment certification. If students demonstrate successful performance on a training ship, that vessel will be facially certified (Eisenhardt, personal interview, 1999).

Dennis Compton, Assistant Dean of the US Merchant Marine Academy at King's Point suggests that the US training academies will need to change their culture and adopt a more European approach, where assessments of mariners on ships are part of the routine commercial package in order to timely meet the STCW 95 requirement of "in-service assessment of practical skills". Today, cadets are trained in schools in the US and not on a routine basis on ships. Officers in the commercial end of shipping do not undertake training as part of their daily duties. While onshore training will continue to be of paramount importance, officers on board will need to become qualified assessors and take over the duty of more formalized assessment of cadets, signing training record books and assuring that those certified are competent. Officers and instructors from State academies can help officers in the commercial side move through this expected transition period. To meet the new STCW standards, King's Point conducted a review of their entire course curriculum, rewriting it and adding a new course of 70 hours of training to meet specialized STCW standards (Compton, personal interview, 1999).

Capt. Andrew Winbow, Head of the STCW and Human Element Section of IMO, explains the international solution in this area: Time spent at sea is time spent on practical demonstration, training and practice. The successful demonstration of practical skill, learned or practiced on board, is recorded in the training record book. This record is "witnessed" or corroborated by an officer who has the necessary skills and certification to judge whether the tasks demonstrated or practiced on board were undertaken safely, effectively, and efficiently. Evidence of having done so, as shown by the record book and by other evidence such as worked examples of calculations or photographs, is subject to examination and assessment to the level necessary to demonstrate the standards of competence required by STCW. This assessment is most likely, but not necessarily, to be done ashore at training and assessment centers approved by the relevant administration (Winbow, personal interview, 1999).

Assessment of criteria

Another area of focus centers upon assessment of criteria to be used by accredited training institutions. Basic guidelines from the US Coast Guard and other governments are still lacking: who will do the assessment, what criteria must the school meet, what will the format of the assessment be, what will the visit be like, who will the reports go to? These guidelines are works in process. The job can be done, but Dr. Eisenhardt asks in what detail and at what cost (Eisenhardt, personal interview, 1999).

The US union representing seafarers, Seafarers International Union (SIU) in cooperation with union-led contractors, created the Seafarers Harry Lundeberg School of Seamanship in Piney Pt., Maryland. This is the largest training facility for non-licensed deep sea merchant seafarers and inland waterways boatmen in the US Lundberg School provides training for entry level mariners, for those already trained seeking professional advancement for career upgrade, and for academic education complementing acquisition of modern technical skills. At the Paul Hall Center for Maritime Training, the union dealt with the assessment criteria problem: courses were revised, new objectives were written, methods of practical assessment were developed, and instructors qualified to meet STCW 95 amendments (Seafarers Harry Lundeberg School Catalog, 1999). Recently, the US Coast Guard approved two courses in basic safety training, a Basic Safety Refresher Training course and a 40 Hour Basic Safety Training course as complying with STCW 95, the first such approved training courses (Seafarers Log, 1999).

Enforcement

Lt. Cdr. George Burns of the US Coast Guard views "enforcement" as the major challenge of STCW 95. For him, the primary question is whether the "flags of convenience", open registries that issue certificates without necessarily requiring a company to comply with all convention regulations, will hire "crews of convenience". Will compliance be paper only, with crewmen able to obtain STCW certification without meeting the competence required of them? The weak link in the system is first, with the company, and then the Flag State. Auditing of seamen is a national responsibility (Burns, personal interview, 1999).

An example of this problem is a proliferation of fraudulent certificates of competency or authentic certificates reportedly issued on the basis of forged foreign certificates, which were found during Port State Control inspections. According to the IMO Sub-Committee on STW, Flag Administrations may have issued certificates to officers on the basis of forged foreign certificates without examining the authenticity of the certificate itself or the basic competence of the applicant. For example, Australia reported 12 such instances of fraudulent certificates found during their Port State Control inspections as of January 1999 (IMO, 1999).

Jon Whitlow, speaking on behalf of the International Transport Worker's Federation (ITF), a democratic global organization of some 533-transport workers' unions in more than 136 countries, emphasizes this same concern. He places the major problem with implementation of STCW 95 and other international conventions upon the "Flags of Convenience". ITF characterizes Flags of Convenience as open registries, where substandard operators choose the "most suitable" registry as their flag without the existence of a true and meaningful connection between owner and flag nor even necessarily the enforcement of minimum international standards. Given the breakdown of the traditional system of loyalty between seafarer and ship owner, where a mariner may take one voyage on a companyship and never sail for that company again, Flag State oversight of companies is crucial. If the Flag State does not ensure that each seafarer whose certificate of competency it has endorsed or recognized meets the standards of competency set by STCW 95, then Port States are left to do the work necessary to determine that those on board a ship can perform as required. The Flag of Convenience system creates an uneven playing field. High caliber companies who invest in good training cannot compete with the marginal operator who shops for the right registry, employs mariners at the lowest rates, and is in turn used by a charterer who is more concerned with the least cost freight rate than with the safety of those on board or protection of the environment. ITF designates 27 Flag States as Flags of Convenience, nations which provide a register "solely as a method of earning revenue", without maritime or seafarer experience or in some cases even a functioning maritime administration. This represents an increase since the 1980s from 11 previously so identified. Until this serious weakness in the international regulatory regime is addressed, there is real concern by ITF that the objectives of STCW 95 cannot be fully met.

ITF has suggested a solution for the Flags of Convenience problem. That is to uphold international law that a genuine link exists between the Flag State and the registered ship exists. Placing IMO or qualified auditors in an oversight function where the auditor can determine that there is a Flag entity responsible for the actions of the ship and implementing international agreements will enforce the law. ITF cites supporting law in Articles 91, 94 and 217 of UNCLOS. (United Nations Convention on the Law of the Sea, see Section 1.1 of this book). In conjunction with increasing Port State intervention and detention, real linkage and IMO or other responsible entity supervision should make registries more meaningful and drive out the substandard shipper (Whitlow, 1999, personal communication, 1999).

The concerns about fraudulent certificates appear to be supported by the evidence uncovered by IMO researchers. IMO is funding a study to determine how extensive such unlawful practices associated with certificates of competency are. According to preliminary findings, "... the problem of fraudulent certification may be more extensive than initially thought". Researchers found widespread unlawful practices such as issuance by Administrations of certificates without any evidence of seafarer

competence or knowledge, forged "inhouse" or black market issued certificates, and other like problems which invalidate the intent of STCW 95 (IMO, 2000b).

Simon Bennett of the International Shipping Federation, which represents 35 national ship owners' associations, emphasizes the need for the right governmental support for the training programs in addition to the willingness of the individual mariner to invest in his/her STCW 95 qualification training. Again, in order to level the playing field, the nations need to do their part and enforce a higher level of quality in training of their mariners so that their certification means the individual meets STCW 95 standards. Worldwide, Bennett sees a leveling of pay scales between developing and developed countries, with a narrowing of the differentials. As an example, the wages of officers from India are approaching those for European officers. With equality of enforcement by the Flag Administration, the increased investment in training should continue reducing the differential in pay between signatories (Bennett, personal interview, 1999).

Cost

The issue of cost of compliance with STCW 95 amendments is a focal point for the maritime academies, the US Coast Guard, the training institutions, and particularly, for the seafarer. Greg Szczurek is a former US Coast Guard officer, member of the US delegation to IMO on STCW issues, long time teacher for Houston Marine, one of the largest training schools in the US and now their Product Development Officer. He has a close working relationship of almost 23 years with the time and money needed to train competent seafarers. In the US system there are many state and federal academies and training schools, like the federal academy at King's Point, the labor union schools operated by SIU and others, the Maine Maritime Academy, and training schools like Houston Marine. Under STCW 95, Houston Marine's mission has changed from being one of helping seamen to pass the written examination to being one of training that person to become an able seaman.

In other countries, the systems range across the spectrum:

- From the highest level of training at academies or in quasi-academy settings;
- to training institutions like Stolt Nielsen in the Philippines or company sponsored academies, with training vessels for cadets who have additional training staff on board;
- to the countries who do no more than convert licenses issued by other countries based on the assumption that the underlying license has been issued validly; and
- to the lowest standard, the "license mill" labor supply countries who simply convert licenses based upon money or the "pay money and get your license" criteria.

Using US numbers as a comparison, it is clear that the cost to the mariner to comply with STCW 95 will not be cheap, either in terms of time or money. Again, the vagaries of the current system will impact the costs. Costs will depend upon what standards the

US Coast Guard and industry eventually agree upon (with the Coast Guard imposing the standards, subject to input by industry) for differing levels of licenses. Licenses range from third mate unlimited, good around the world on any vessel of unlimited tonnage, to the lower level licenses. A unique license is being negotiated between industry and the US Coast Guard, for a restricted license for "offshore support vessels" for special purpose trade in the Gulf area.

Under the proposed curriculum for basic training, the US cost would be about $7000 to $8000. For a third mate level, the training time needed to result in an STCW 95 Certificate would be approximately 80 days at an approximate cost of $20,000 to $25,000 at a school like Houston Marine. This would require completion of 360 days at sea for a candidate in an approved program (e.g., academy cadets) or 3 years of sea time for "hawse type" marines who attend the Houston Marine type school. Training for a limited, restricted "OSV" license may require an additional 35 classroom days, over and above on-board training at a cost of $15,000 to $16,000, if this restricted license proves acceptable to the US Coast Guard. These costs do not account for the "hidden" administrative costs of record keeping by the company, nor the effort expended by the licensed candidates. Mariners who work 28 days on board, with 14 days off, will need to spend much of their time off over a period of several years to acquire sufficient training to meet STCW 95 certification requirements. This results in substantial delays in moving to higher level positions and equates to a real loss of wages for the average seafarer, moving from $75.00 per day as a seamen, to $95.00 per day as an able bodied seamen, to $145.00 per day as a mate. Multiplying the differential in rate by a delay of 6–8 or more months in reaching a higher level of certification makes the true cost to the seafarer of STCW 95 compliance substantially more than estimated.

For those who are members of a union or employees of companies willing to bear the cost of training, compliance with STCW 95 should not cause a substantial financial problem. For seafarers without these types of resources, in the US and developing countries globally, cost may become an impediment to compliance (Szczurek, personal interview, 1999).

However, there are solutions to the cost problem. Increasingly, the cost of STCW 95 training and compliance, borne by the seafarer, is handled through the trade unions in the US and worldwide, or through manning agencies. For example, in the US the Marine Engineer's Beneficial Association (MEBA) is one of the oldest maritime labor unions. The MEBA Engineering School provides quality training for licensed ship's officers. The school uses a union training fund to pay their cost so that such officers meet compliance without any additional cost. Companies support their own cadets in many parts of the world. In other nations, the manning agency provides the cost of training in return for the mariner contracting with the agency for placement (Kincaid, personal interview, 1999).

Qualified seafarer shortage

While there is considerable debate about the reasons, there appears to be agreement as to the existence of a problem: a shortage of good quality mariners in higher level positions. Of concern to the industry is whether and how much STCW 95 will exacerbate the manning problem worldwide. Will the Convention put such a strain on the labor pool of qualified seafarers, that fleets fall short of their crew complement, especially in officers at higher levels by the year 2002?

An Interim Manpower Survey conducted by the International Shipping Federation in the summer of 1998 supports these conclusions:

- The gap between supply and demand, most particularly for engineers is increasing—48% of ISF members reported an increase in demand for seafarers since 1995, with 45% reporting a decrease in national officer supply for that same time period;
- Sixty-four percent of the national associations reported a shortage of national seafarers;
- Shortages are most severe in officer grades in the engineering department and chief officers in the deck department;
- The average age of senior officers is a critical factor, with 58% reporting an increase in average age;
- The number of new officer trainees entering the industry is declining for ISF members and not increasing significantly for nation states; and
- While seafarers exist to fill the berths, 45% of members reported an insufficient number of competent and qualified ratings (ISF, 1998).

STCW 95 is not the cause of a manpower shortage. The primary causes are believed to be the increasing age of the senior officer pool, that the economy in the Western world is good and making money in a shoreside job, without the unattractive elements of long sea voyages is far easier, and that the industry is contracting with a greater number of qualified mariners coming from countries other than the traditional sources of Europe, Austral Asia, and the US (Winbow, personal interview, 1999; Kincaid, personal interview, 1999; Whitlow, 1999).

However, the impact of STCW 95 may be that it augments the perceived shortage problem. As an example, the Philippine nation is the world's largest supplier of seafarers. While this country may have in excess of 100 training institutions, only a handful of these currently comply with basic STCW training standards. With much help from Norway, the US and other countries, the Philippines is upgrading their maritime educational system. However, the seafarer output from the surviving colleges, after closure by the Philippine government of those which do not meet the standards, of qualified mariners is forecasted as being must less than in the past. The mariner pool is aging worldwide, most specifically seen in the senior officer cadre. With the expected "purging" of these and other officers under STCW 95 when their certificates are due for revalidation, the impact on the industry is uncertain. The question is where

will the captains and chief engineers come from to replace those currently in service under the old convention and system (Petersen, 1999; Compton, personal interview, 1999).

Solutions exist even to the projected manpower shortage. The Seafarers International Union in the US has continued its aggressive system of recruiting, in place since 1967. John C. Wiegman, Assistant Director of the Seafarers Harry Lundberg School, points to the success of this recruitment effort, citing a constant number of replacement younger members for retirees, increased class sizes, augmented pace of the programs, with the result that the union is a good manpower provider (Wiegman, personal interview, 1999). Internationally, the industry is directing its attention toward two "huge suppliers" of qualified seafarers, China and the former Soviet Union (Compton, personal interview, 1999; Young personal communication, 1999). In the long run, IMO believes that STCW 95 may improve the worsening shortage situation by improving the quality of "mediocre" seamen as they upgrade and by weeding out the lower end ratings surplus. Capt. Andy Winbow of IMO believes that officers successfully doing their job for years will continue to perform competently and that whatever retraining is needed for STCW compliance will enhance their performance (Winbow, personal interview, 1999). While STCW 95 may have "some impact" on seafarer availability, the exacerbation of an already existing problem should not in any way be a reason to invalidate the Convention's tough criteria for qualified seafarers (Kime, personal interview, 1999).

This catalogue of problems may be compared to a grieving process for the old way of doing things, in which industry's reaction is grouped into various stages of grieving: shock, anxiety, resentment, and anger. The end goal is acceptance. The positive approach to viewing STCW 95 is that it will make a difference, particularly if the playing field is leveled. If the Parties apply standards evenly, if each of those in the safety net enforces the requirements, and if seafarer competence improves, the result should be less accidents and cleaner oceans. By its very terms, the convention amendments have contributed positive impacts to all those involved:

- To the ship owner concerned with the true cost of shipping, a decrease in loss and safer operations;
- To Flag States for achieving more harmonized implementation among other flags;
- To Port States, for greater authority to detain non-complying vessels;
- To the public for increased prevention and true cost accounting; and
- To the seafarer for a safer work environment and increased advancement potential.

4.2.5. Intervention Convention

Coastal States affected or threatened by a marine pollution incident from an oil spill in coastal or offshore territorial or international waters may take protective action under the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969 (Intervention Convention). In force since 1975, the

Intervention Convention was extended by the Protocol of 1973 to other substances, such as noxious substances, liquefied gasses and radioactive substances. As of 1999, 72 governments, or 66% of world tonnage, are signatories to this Convention (IMO, 1999a).

The purpose of the Intervention Convention is to recognize that measures of an exceptional character on the "high seas" might be necessary to protect a country's coastline and related interests from major harmful consequences of a maritime casualty. The standard for taking action is "a threat of grave and imminent danger to the marine environment or related coastal interests". This standard is regarded by some as a strict standard, requiring a high degree of danger (Williams, 1998). Right of action extends beyond a territorial sea. For the purpose of the Intervention Convention, the term "high seas" includes the Exclusive Economic Zone (EEZ). The treaty gives coastal states the right to take action to "prevent, mitigate or eliminate grave and imminent danger to their coastline or related interest from pollution or threat of pollution ... following a maritime casualty" (Intervention Convention). A coastal State can either attempt to persuade the captain or ship owner to take such action as is necessary to prevent an accident, such as towing the vessel safely to harbor or elsewhere, or the State may take such direct action as may be appropriate under the circumstances. Activity by the State may include boarding a ship, imposing preventive measures, which the captain must comply with, and salvaging or even sinking the vessel.

Under the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978, (MARPOL 73/78), a ship has an obligation to contact the nearest State and inform that administration of an incident or threat of an incident (Art. I, Protocol I). In the US, under the Federal Clean Water Act (33 USC Section 1321 (b)(5)), there is an obligation to "immediately notify" the appropriate agency of the United States government of any discharge prohibited by the statute (in a harmful quantity). Failure to notify is a criminal offense (See Section 4.3.7 of this book). Such advance notice, or information gained by the State's own radar or other preventive systems, allows the coastal State to prevent what might otherwise be a serious spill. States subject to the "passing ship syndrome" where ships from foreign Flags use the waters in or near the State as a means of passage, view the Intervention Convention as another measure of control by the Port State over potentially damaging oil spills.

An example of the right of a coastal nation to exercise its rights under the Intervention Convention occurred when the Prefet Maritime, (the French authority, that was established to exercise the right to protect the three coasts of metropolitan France from threats from ships) acted to protect its waters from a potential, serious oil spill. When an Iranian tanker laden with 200,000 tons of oil, lost its propulsion in mid-channel near Cherbourg, while bound for Rotterdam. The tanker wanted to proceed through the narrow Straits of Dover, no more than a mile wide, by tug power. The French authorities refused to allow such a passage, believing that a towing operation

in the limited passage with dense traffic would pose a serious danger of a potential incident. The ship was required to proceed to a deep draft harbor, where its product was lightered from the ship's hold to a waiting vessel, at the expense of the ship owner (Levy, 1995).

The US is a party to the Intervention Convention, and has enacted its own implementing national legislation (33 USC 1471, et seq.) from spills for oil or hazardous substances. There is a complex interface between OPA 90 and the Intervention Convention. OPA 90 is silent as to the procedures to use when "intervening" beyond the territorial sea and on following the consultation requirements of the Intervention Convention and Intervention Act (33 USC 1475). The US Coast Guard is the designated legal authority to intervene and to take the steps necessary to protect US interests in a ship related pollution incident on the high seas and in navigable waters. The US Coast Guard Marine Safety Manual (Vol. 9, Ch. 5.A.7.b [High Seas] and 5.A.7.c [US Waters and Territorial Seas]) sets the procedures for taking action (Williams, personal communication, 1999).

The operative conditions for intervention to occur are stated in the Intervention Convention, Article I: "Parties to the present Convention may take such measures on the high seas as may be necessary to prevent, mitigate or eliminate grave and imminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil, following upon a maritime casualty or acts related to such a casualty, which may reasonably be expected to result in major harmful circumstances. In circumstances of grave, imminent danger, if the ship master or owner takes no action or takes unsatisfactory action, the US Coast Guard will intervene to eliminate the threat, will avoid unnecessary interference, and will cease intervention as soon as the threat is eliminated or mitigated. Consultation with the Flag State of the ship involved and others will take place as much as possible before an actual intervention is conducted" (Williams, personal interview, 1998, personal communication, 1999).

Internationally, use of the Intervention Convention may be the ultimate way for a coastal State to protect and control its own waters, even from "passing ships" where there is an actual or threatened incident of pollution from oil and other substances (IMO, 1999a; Levy, 1995).

4.3. US and International Regulations; and the Courts

4.3.1. OPA 90 (Reproduced in Appendix II)

In the US, the *Exxon Valdez* oil spill led to the development of the Oil Pollution Act of 1990 which is commonly referred to as OPA 90. OPA 90 introduced concepts of innovative protection for US waters from oil pollution, enforcement mechanisms, including a national response system to prevent spills, and insistence upon the concept that "the polluter pays" not only for the actual costs of a clean-up, but also for damage

to the public's natural resources. For many years during IMO meetings, the US lobbied, without success, for increased coverage of damages and greater compensation to be paid under the 1969 International Convention on Civil Liability for Oil Pollution Damage (the 1969 Civil Liability Convention) and the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (1971 Fund Convention). (See Section 4.3.3 of this book for a discussion of these Conventions.)

After the *Exxon Valdez* spill, Congress determined that it was in the best interests of the US to protect its marine environment through passage of its own legislation. The US enacted OPA 90, which provided for strict liability for the polluter, increased defenses to limits of liability, increased scope of coverage for natural resources damaged, and safeguarded the national system from international preemption of federal and state law. Many in the global community regard this action on the part of the US as a direct rejection of the international system of oil spill coverage and control (Holt, 1995; Olney, 1999).

OPA 90, found in Pub. L. 101-380, 18 August 1990, (33 USC Section 2701 *et seq*.) consists of nine Titles. Title III pays lip service to the concept of international comity. Title III provides for adoption and implementation of international conventions relating to liability and compensation, so long as their provisions are "at least as effective as Federal and State laws in preventing incidents and in guaranteeing full and prompt compensation for damages resulting from incidents" (Section 3001). Titles II, VI, and IX deal with technical and conforming amendments to other laws. Title V contains specific provisions relating to prevention and removal of oil spilled into Prince William Sound, Alaska. Title VII establishes an Oil Pollution Research and Development Program, which has been problematical in terms of funding actual research. Title VIII repeals the Trans-Alaska Pipeline System Authorization Act, retaining the Trans-Alaska Pipeline Liability fund only until resolution of remaining claims from the *American Trader* spill.

The uniqueness (or difference) in OPA 90 is found in Titles I and IV. Title I focuses upon the financial elements of the Act: establishes strict liability for oil spills, enumerates the type of damages covered, outlines defenses to liability and limits of the responsible party for damages, sets forth the actions which negate those limits, authorizes access to the $1 billion Oil Spill Liability Trust Fund (previously established in 1986) as the overall funding source, and requires ship owners to demonstrate financial responsibility in order to trade in US waters. Title IV covers all aspects associated with prevention and removal of oil: establishes the Federal government as the authority for directing and managing spill response, requires vessel and facility response plans for worst-case discharges for a vessel and largest foreseeable discharges for a facility, in adverse weather conditions, deals with drug and alcohol use of mariners, licensing and revocation of mariner licenses, details of navigation, such as vessel traffic systems, monitoring devices for tank levels, and tank vessel construction standards, and provides for a double-hull phased replacement of single-hull oil tankers and barges.

Additionally, Title IV contains the civil and criminal penalties for oil polluter of US waters (Olney, 1999).

The US is becoming increasingly the largest importer of oil in the world, importing at least 56% of the 18.7 million barrels of oil consumed by Americans per day for transportation, heating, power for industry, and production of the more than 3000 daily products used by consumers (Moore, 1999). As such, the US is a major player in the Port State control arena. The definition of jurisdiction of its waters is important in its effect upon foreign flag vessels trading in oil to the US. Territorial jurisdiction under OPA 90 covers a discharge of oil in the navigable waters of the US, "beginning with marshes and extending seaward 12 miles to the limits of the territorial seas", and in the exclusive economic zone, which area extends seaward 200 miles. The US waters protected are the continental US and American Samoa, the Marianas, Guam, the US Virgin Islands and Puerto Rico (Olney, 1999; Etkin, 1998). (See also Section 4.2.5 of this book for discussion of jurisdiction under the Intervention Convention.)

OPA 90 goals can be grouped into four intended outcomes:

- Reduce the number of vessel casualties;
- Reduce the number of oil spills;
- Reduce the quantity of oil spilled; and
- Increase response effectiveness.

These four "outcomes" can be used to classify the forty-one or more rule makings developed by the federal agencies charged with regulation and policy guidance in response to OPA 90. The agencies responsible for various parts of implementation of OPA 90 include the US Coast Guard, the Environmental Protection Agency, National Oceanic and Atmospheric Administration and the Department of Transportation's Research and Special Program Administration—Office of Pipeline Safety. The cost of compliance with these regulations has been expensive for industry, in the realm of nearly $17 billion since 1990 (API, 1999). API (the American Petroleum Institute) is the national trade association representing over 400 American companies involved in all aspects of the petroleum industry. Indications are that the benefits of compliance justify these costs. Fewer accidents and spills of a substantial nature save companies significant money (API, 1999). According to another source, enforcement by the US Coast Guard of just 11 principal OPA 90 regulations will cost approximately $11 billion, including the double-hull vessel response plan, and certification of financial responsibility requirements. (See LloydsList website: www.LloydsList.com, 5/21/2001.)

Other sections in this book discuss many of the provisions of OPA 90. The following is a listing of key sections of the book related to OPA 90 for ease of reference:

- Liability and Definitions of Oil covered, other definitions—4.3.3;
- Limits and defenses—2.2 and 4.3.3;
- Response—vessel response plans—2.2 and 2.3;
- National Response system and contingency planning—2.2 and 2.3;

- Natural Resource Damages—4.3.2;
- Oil Spill Liability Trust Fund—4.3.5; and
- Certificates of Financial Responsibility—4.3.5.

The liability and compensation scheme, discussed in much greater length in the sections referenced above, is summarized as follows: Under OPA 90, a party who spills oil or threatens harm from a potential spill of oil is *strictly liable* for damages enumerated under the provisions of the Act. "Strict liability is a legal doctrine which imposes on a person who engages in a particular activity the responsibility for compensating others for the harm he causes, regardless of fault" (Olney, 1999). A responsible party, or spiller, is liable for damages for the direct costs, such as clean-up and removal of the oil, and compensatory damages, which include among others, harm to natural resources. There are four defenses available to the Responsible Party to avoid strict liability for the covered damages. Three are complete defenses to liability because the circumstances are beyond the spiller's control: an act of God, an act of war, an act of a third party not an agent, employee or contractor hired by the responsible party. The fourth defense may be asserted against claimants. The Responsible Party can defend against a third party claim if the claimant caused the spill.

Even when the polluter has the right to assert these four defenses, specified activity on his part may negate their use. The responsible party must fulfil his OPA 90 obligations in order to assert these defenses. If the spiller fails to report the spill, to cooperate in the removal of the oil spilled, or to comply with official removal orders, then the defenses may be lost (33 USC Section 2703).

The limits of liability depend upon the size and type of the vessel or facility involved:

- Tankers greater than 3000 gross tons limit liability to the greater of $1200 per gross ton or $10 million;
- Under 3000 gross tons, tankers limit liability to the greater of $1200 per gross ton or $2 million;
- Other than tank vessels, the greater of $600 per gross ton or $500,000;
- Offshore facilities, (except deep water ports) $75 million plus all removal costs; and
- Onshore facilities and deepwater ports limit liability to $350 million (33 USC Section 2704).

OPA 90 does not preempt state law. States may impose different limits of liability, assess fines and punishment in varying amounts, and set requirements relating to the prevention, clean-up, and compensation for such spills (Section 1018, 33 USC Section 2718).

The Oil Spill Liability Trust Fund (The Fund), accessed through authorization of OPA 90, is funded by a 5% barrel tax on all oil movements. The Treasury Department suspended that tax at the end of July 1993, reinstated it again in July 1994, and then

discontinued it again in December 1994. In the event that the responsible party cannot satisfy OPA 90 claims, then the Fund can make payments, up to $1 billion per incident, of which only $500,000 can be paid to satisfy natural resource damages (Section 1012, 33 USC Section 2712).

Liability exists "(n)ot withstanding any other provision of law". This phrase means that a vessel owner cannot limit his liability to the value of the vessel and its freight, as provided under the Limitation of Liability Act, but rather, the ship owner/operator is subject to the limits of OPA 90 (Etkin 1998, and Olney, 1999).

OPA 90 is an important motivator to shift ship owners/operators into the safety culture era. According to Admiral William Kime, (former Commandant of the US Coast Guard and now a CEO and Vice President of a major shipping company and member of the executive committee of the largest shipper trade association, BIMCO), real changes are occurring at all levels. The leaders of the oil transportation industry are requiring incorporation of a safety culture into the business of shipping not only in messages delivered to the public, but also behind closed doors at association deliberations on policy and at all levels of mariner activity on board ships. Safety is being actively adopted because the public demands it, because it is good for business and out of fear of the repercussions if companies do not move into a true safety management mode. OPA 90 provides the framework and the legal underpinning behind the shift from evasion and compliance cultures to the safer way of doing business (Kime, personal interview, 1999).

Thomas Allegretti, President of the American Waterway Operators praises the impact of OPA 90 as a great protector of the marine environment. He thinks "it had the intended effect of putting people on notice that, if they wanted to operate their company into the next century and be profitable, they had better get with the program. Also, it has had the effect of pushing some operators to get out of the business who simply weren't willing to incorporate the protections that the law required. So as a result of that, some companies have folded up, sold their assets and gotten out; taken their money and done something with it that's not related to marine transportation anymore. I think that's been positive as well" (Allegretti, personal interview, 1999).

Thomas R. Moore, President of Chevron Shipping Company, on behalf of INTERTANKO and the American Petroleum Institute, in his testimony before Subcommittees of the US House of Representatives praises OPA 90 for its positive impact in several areas:

- **Double hulls:** OPA 90 requires that new tank vessels of 5000 gross tons or greater must be double hulled, unless they are used only to respond to oil spills. All new tank vessels are to be double hulled. For existing vessels, there is a phase out schedule which began in 1995 and runs until 2015. The schedule retires the older and larger vessels first (Section 4115; 46 USC Section 3703(a)). The US Coast Guard published regulations defining the term "double hull", specifically rejecting design alternatives to true double-hull construction (60 Fed. Reg. 13,318, [10

March 11995]). As of 2015, existing vessels of less than 5000 gross tons, and certain other classes of vessels must be fully double hulled (Olney, 1993).

Mr. Moore regards the double-hull provision alone as having a "significant impact on the industry". The greatest risk of accidents occurs when a vessel enters port, traveling at low speeds in constrained waters. For this potential low energy incident, the double-hull requirement "... is a prudent measure that has reduced the risk of an oil spill at this most critical portion of any voyage". The phased approach works, moving older vessels out of service and new ones into existence in "an orderly fashion". Because of the scheduled phase out, "... shipyards are fully capable of handling this transition and the energy supply chain has not been disrupted ..." (Moore, 1999).

- **Manning standards:** OPA 90 limits the hours a crew member can work. On self-propelled tank vessels, officers and crew members may not work more than 15 hours in any 24-hour period, nor more than 36 hours in any 72-hour period, except in an emergency or drill (Section 4114(b), amending 46 USC Section 8104). Since human error accounts for more than 80% of all incidents and fatigue is a major source of accidents at sea, (see Section 1.4 of this book for discussion), this provision of OPA 90 "has not only reduced the potential for an accident, but has provided a common standard for the industry" (Moore, 1999). STCW 95 addresses the question of fatigue and the human element considerations in its limitations on work hours and manning requirements as well. (For further discussion see Section 4.2.3 of this book.)
- **Spill response capability:** The provisions of Title IV have changed the face of oil spill response in the US, moving response ability from limited quantity and geographic positioning of resources into a modern system of significant volume of spill response clean-up equipment, geographically well situated, used according to good planning standards. "The planning standards *and* the requirement for all vessels to have a pre-approved spill response plan, *with* cited, approved contractors is *very good*. So is the requirement for a named available *Qualified Individual* that has the authority to execute these response plans" (Moore, 1999, emphasis added).

Even in the face of such positive endorsement, there are certain problem areas created by OPA 90 provisions, which are the subject of current discussion and concern in the shipping industry. These "hot topics" may well shape, and in some cases, may hinder the development of the safety culture.

- **Double Hulls:** After a comment period, the US Coast Guard affirmed its intention to hold vessel owners to the OPA 90 phase out schedule and found that changing the hull configuration of a single-hull vessel to a single hull with double sides or a double bottom will not change the original phase out scheduled (64 F.R. 19,575, [21 April 1999]).

  While the international community adopted a similar requirement in MAR-

POL 73/78, that convention does provide for an acceptable alternative to double hulls, such as the "mid-deck" design. However, the US is clear that regardless of the international convention provision, for those ships transporting the 75% of oil imported into the US, only double hulls will be allowed into US ports. One author believes that this unilateral position of the US has increased the risk of oil spills from older tankers, which will not be retrofitted between now and the year 2015 due to the high cost of double hulling (Holt, 1995).

In the wake of the 1999 *Erika* oil spill, on accelerated phase-out period for single-hull tankers under MARPOL 73/78 has been approved by the IMO Marine Environment Protection Committee (MEPC) with a proposed revised regulation 13G of MARPOL in April 2001. The proposed schedule will be more in line with the US scheme (IMO, 2000g).

- **Pre-emption:** Under the savings clauses of OPA 90, so long as the laws are consistent with the federal scheme of regulation, federal law does not preempt state law. State and local governments can impose liability and financial requirements, as well as regulating ship operation based on the peculiarities of local waters for "special precautionary measures" in addition to and different from those provided for by the federal Act (Section 1018, 33 USC Section 2718). This doctrine has been the subject of recent legislation in a case filed in the federal court system in the State of Washington, commonly referred to as the INTERTANKO case (*The International Ass'n of Indep. Tanker Owners (INTERTANKO) v. Lowry*, 947 F. Supp. 1484 (W.D. Wa. 1996), *aff'd in part, rev'd in part, and remanded sub nom. International Ass'n of Indep. Tanker Owners v. Locke*, 148 F. 3d 1053 (9th Cir. 1998). The Ninth Circuit Court of Appeals held that states may issue operational requirements, which exceed federal requirements. Design requirements (for example, over such matters as emergency towing packages and navigational equipment requirements), are subject to federal control over vessel design and construction standards.

  INTERTANKO and the US Department of Justice requested review of this decision by the US Supreme Court. On 6 March 2000, the US Supreme Court issued its opinion. The findings in the decision will impact significantly the rights of States to impose stricter or different requirements from those set forth in relevant federal statutes. While recognizing that states are not preempted from enacting their own pollution regulations under OPA 90, the US Supreme Court identified the strict conditions under which a state may do so where a federal interest has been manifest under OPA 90, and other federal acts. (See Section 4.3.7 of this book for further legislative discussion.) Where these federal acts or US Coast Guard regulations promulgated under these acts exist, the savings clauses of OPA 90 are preempted by the federal regulations. Only the federal government may regulate "the design, construction, alteration, repair, maintenance, operation, equipping, personnel qualifications and manning of tankers". The Court struck down four of Washington State's regulations and remanded the balance for review

by the court (*United States v. Locke* (98-1701, 98-1706), 148 F. 3d 1053, rev'd and remanded, US Mar. 6, 2000).

The impact of this decision may be to cause a full review of other states' regulatory statutes regarding the oil tanker trade. Eighteen States have adopted "mini-OPAs" to avoid what one observer terms a "patchwork" of regimes, a proliferation of regulations by coastal states which undermine the uniform set of standards, rules and plans instituted by OPA 90 and implemented by the US Coast Guard regulations. The secondary impact of this decision is to promote in those adopting the safety culture, such as the organization of independent ship owners, INTERTANKO, more cooperation with the relevant Federal governmental agencies. This cooperation is needed to ensure that there is proper funding and support in place so that programs and tools designed to promote safety and environmental protection can work (Ringbakken, personal interview, 2000). Sahatjian (2001) suggests that this and subsequent US Supreme Court decisions "... send a strong message in support of the federal government's exclusive authority in the area of foreign relations ...", limiting US States' rights and powers to areas where traditionally States have the power and are not in conflict with international obligations of the US.

While the Supreme Court did not address the impact of state regulations on international treaties and the international regimes in place, this decision may have a "chilling effect" upon attempts by, for example, the European Union, to impose stricter requirements on oil tankers than those called for under the international treaties in place. For example, in its recent Communication, the European Commission outlined measures it may seek to enforce directly within its Member State territories. Certain of the directives sought may impinge upon requirements already covered under MARPOL 73/78 and other international treaties. Rather than taking unilateral action, the European Communities (Member States) may be required to proceed through IMO channels to amend or revise current international treaties (Commission of the European Communities, 2000).

- **US Coast Guard Increased Role without Funding/Support:** The US Coast Guard functions in at least two capacities under OPA 90 and the international conventions to which the US is a contracting party: as a Flag State and as a Port State. OPA 90 provisions impose upon the US Coast Guard increasing demands for implementation and enforcement at a time during which the authority's funding and personnel power are decreasing. Unrealistic resource allocation may impact the ability of the US Coast Guard to discharge its significant obligations (du Moulin, 1998).
- **Concursus:** OPA 90 introduced a new concept, that claims resulting from an oil spill would not be subject to the Limitation of Liability Act of 1851, (46 USC Section 181) but rather that potential claimants could litigate claims in various jurisdictions, under state and federal law. This was a change in previous maritime law. Prior to OPA 90, the vessel owner could consolidate all claims arising from

a single incident into one court proceeding, in a consolidation action called *concursus*, the concurrence or gathering together of claims into one lawsuit.

Under OPA 90, in the event of a large spill, a vessel owner or responsible party may be called upon to defend claims in numerous federal and state courts. An insurer will only pay compensation up to the limits of its liability, leaving claimants in a position of the first to judgment possibly being the only one to receive compensation for injuries, unless the responsible party loses his right to limit the claims. For the public, multiple suits mean a "race to the courthouse", legal expense, time and effort of all lawyers on all sides of the issue, including trustees, which money might better be spent upon restoration of the damaged natural resource. This is a sorely contested issue for the shipping industry. Industry argues that the lack of concursus goes to the heart of OPA 90 with its limits of liability. Without concursus, they assert that the OPA 90 cap is "illusory" (AWO, 1998a; McCormack, 1999, personal interview; Hobbie, personal interview, 1999; Kime, personal interview, 1999).

Concerns regarding criminal aspects of OPA 90 are discussed in Sections 4.3.7 and 4.3.8 of this book.

In the final analysis, many believe that OPA 90 is working. OPA 90 impacts international shipping in its provisions worldwide: due to the developing body of law and to the activity of those involved in the chain of responsibility, from the regulators to industry, to the International Maritime Organization. The rate of large spills (over 5000 barrels) from the tanker industry is dropping: from 24.2 spills per year in the 1970s, to 8.9 spills per year in the 1980s, to 7.8 spills per year in the 1990s. In the United States, the post-OPA 90 spill rate is substantially lower. There have been no large spills from tankers in the US since 1991 and the incident rate is 0.5 spills per year. OPA 90 is considered "an overwhelming success" (Moore, 1999; API, 1999).

4.3.2. Natural Resource Damage Assessment

The use of OPA 90s civil remedies for damages to natural resources from oil spills has become well settled US law. OPA 90 provides recovery for:

- Restoration costs—the cost of restoring, rehabilitating, replacing, or acquiring the equivalent of, the damaged natural resources;
- The diminution in value of those natural resources pending restoration; and
- The reasonable cost of assessing those damages (Section 1006(d), 33 USC Section 2706(d)).

All recovered damages are used to restore, replace, and rehabilitate the injured natural resources or to acquire equivalency of the resources injured, and to pay the costs of environmental assessments.

OPA 90 designated the National Oceanic and Atmospheric Administration, US Department of Commerce (NOAA) as the natural resource trustee responsible for de-

veloping methods for assessing environmental damages and procedures for restoring natural resources affected by an oil spill. The resulting Natural Resource Damage Assessment (NRDA) Final Rule (61 Fed. Reg. 440, 5 January 1996, as codified at 15 C.F.R. Part 990 (1998)), has survived attack in the US courts (*General Electric Co. v. US Dept. of Commerce*, 128 F. 3d 767 (D.C. Cir. 1997)).*

The goal of NRDA is to return natural resources and their multifunctional uses to their baseline, pre-spill condition while compensating the public for the losses occurring in the interim period, from spill incident until restoration is complete. Baseline refers to "the condition of natural resources and services that would have existed had the incident not occurred" (NOAA, 1997a). Focus is not on the monetary value of injured resources, but rather it is upon the actual cost of restoring those impacted resources to baseline (Burlington, 1999).

NRDA has these three phases:

- *Preassessment*—during which the trustees (NOAA, other departments of the US government, states and tribal nations designated under OPA 90) determine if they have jurisdiction to proceed and if they should proceed, i.e., Resources have been injured under OPA 90 and feasible restoration alternatives exist to address these injuries;
- *Restoration planning*—during which the trustees evaluate the injuries to natural resources and services and using that information, determine the need for and scale of restoration actions. This phase involves injury assessment and restoration planning. It provides the link between injury and restoration; and
- *Restoration implementation*—during which the Draft Restoration Plan created during the second Phase becomes a Final Restoration Plan, is presented to the Responsible Party for funding, or becomes the basis for a claim for civil damages in federal court or for appropriation from the Oil Spill Liability Trust Fund (NOAA, 1997a).

Injury assessment determines the nature and extent of the injuries and provides a technical basis for evaluating the need for and scale of restoration actions. The inquiry at this stage decides if there was injury, defined as "an observable or measurable adverse change in a natural resource or impairment of a natural resource service. Injury may occur directly or indirectly to a natural resource and/or service. Injury incorporates the term's destruction, loss, and loss of use. Baseline studies are used, when available, to quantify the degree and extent of the injuries by comparing pre- and post spill conditions, and to estimate the time until the resource returns to pre-spill condition.

For example, in the 19 January 1996 *North Cape* spill off the coast of Rhode Island, trustees determined during the Restoration Planning phase that there was significant injury, that restoration actions were needed to repair the environment, and that they

* See 66 FR 39264 7/31/2001 for proposed amendments to NRDA as a result of clarifications sought by the US Circuit Court.



By Etta Hulme, *Fort Worth Star Telegram*, reprinted in The *Marin Independent Journal*, April 14, 1989.

could quantify and assess the effects of the 828,000 gallons of fuel oil on the natural resources or services, … "such as the mortalities of both flora and fauna, the oiling of the beaches, and the loss of use of public areas" (O'Connor and Mayer, 1998).

In quantifying injury under NRDA, trustees may use any reasonable assessment procedure appropriate for assessing restoration needs for the specific incident, so long as the method is "reliable and valid" and cost-effective for the incident. An injury assessment must meet Final Rule standards by:

- Providing assessment information of use in determining the type and scale of restoration appropriate for particular injury;
- Relating reasonable additional cost to expected increase in quantity and/or quality of information for a procedure which is more complex; and
- Being reliable and valid based on technical judgments of experts in a particular field consistent with best technical practices (Burlington, 1999).

Models may be considered under NOAA's rule. These include Department of Interior's Natural Resources Damage Assessment Model for Coastal and Marine Environments, compensation formulas and procedures based on field methods, laboratory methods, literature-based procedures or combinations of these (Burlington, 1999).

Once injury assessment is complete, the trustees develop a restoration plan. Selection of the restoration alternative is the next area of focus. The trustees must "identify a reasonable range of restoration alternatives, evaluate and select the preferred al-

ternative(s), and develop a Draft and Final Restoration Plan". Under the Final Rule, restoration actions are either *primary* or *compensatory. Primary restoration* actions are taken to return the injured resources to their pre-spill state, on an accelerated time frame. Natural recovery without human intervention is an option to be considered along with other alternatives. *Compensatory restoration* actions are taken to make the environment and public whole for the resources and/or services lost from the date of the incident until *primary restoration* is complete (NOAA, 1997a).

To ensure that a restoration plan addresses all injuries, trustees must scale the restoration actions appropriately. The rule is incident based. Trustees may use one or more of several approaches, depending on the actual needs of the incident. Where actions can provide natural resources and/or services of the same type, quality and value as those lost, trustees may use a *resource-to-resource* or *service-to-service* approach. The concept behind this approach to scale is to produce an equivalent quantity of natural resources or services lost due to the injury. The implicit assumption is that the public will accept a one-to-one trade-off between a unit of lost habit services and a unit of restoration project services. "The trade-off is not for resources, but for units of services a restoration project provides". Exact replication is not required, nor expected. Equivalency is the goal (NOAA, 1997a, b).

NOAA's multidisciplinary team of experts value natural resources in the broadest sense, as … "natural assets, which provide services through time to other natural resources and humans". Specifically, the term *natural resources* "means land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources, belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States" (NOAA, 1997a). In the *North Cape* spill restoration alternatives of the resource-to-resource or service-to-service approach included for lost lobsters, for example, hatchery stocking, habitat enhancement creations, transplanting of juveniles, and creation of a lobster sanctuary (O'Connor and Mayer, 1998).

Trustees may use the *valuation* approach when impaired and replacement services are of a different type, quality and/or value, where the one-to-one trade-off is inappropriate. Under this approach, trustees calculate the value of the services lost, the value of the services to be gained by the proposed action, and then scale the restoration so that these values equal each other. The trustees determine what *compensatory restoration* is necessary to compensate the public for the interim losses and the Responsible Party becomes liable for the cost of implementing that restoration action. This approach relies upon the concept that "lost value can be determined using one of a variety of possible units of exchange, including units of natural resource services or dollars" (NOAA, 1997a; Burlington, 1999).

Current NOAA Trustee practice is to use a method for scaling the size of compensatory restoration projects called *Habitat Equivalency Analysis* (HEA) in between 50% to 80% of cases under OPA 90 (Tomasi, 1999). HEA answers the question of what scale of compensatory restoration action will compensate for the interim loss of natural resources injured and their services from the time of the incident until

full recovery of these resources. The restoration process moves through an orderly analysis: Trustees determine and quantify the injury, develop restoration alternatives, both primary and compensatory, scale these, and select the preferred alternative. HEA comes into play during the scaling of the alternatives. The goal of HEA is to ensure that present discounted value of project gains equals present discounted value of interim losses". In other words, restoration alternatives must be of the same type and quality of services and comparable value as those lost. Scaling helps determine the size of the project to reach this one-to-one trade-off.

Necessary conditions for use of HEA are that:

- "... a common metric can be defined for services that captures any significant differences in the quantities and qualities of services provided by injury and replacement habitats; and
- the changes in resources and services (due to the injury and the replacement project) are sufficiently small that the value per unit of service is independent of the changes in services levels".

What these preconditions involve is an assessment of *on-site characteristics* (such as stem density, canopy coverage, fish density), i.e., the capacity of the ecosystem to provide services on site to humans and other resources and the *landscape context*, the opportunity of the project to supply these services off-site (NOAA 1997b).

A case in which NOAA litigated the use of HEA in the Florida Keys Sanctuary is instructive about how this scaling approach may be used in resolving future compensatory restoration alternatives. In the case of *US v. Melvin A. Fisher, et. al.,* 977 F. Supp. 1193 (US Dist. Ct. SD, FLA, 1997), NOAA proposed the use of the HEA methodology and obtained a restoration award of $351,648.00 to implement an alternative restoration project for 1.55 acres of seagrass habitat, of $211.130.00 for assessment and response costs, and of $26,533.00 in interest. The case involved damage caused by treasure hunters creating holes, "blow-holes" in the seagrass in the National Marine Sanctuary of the Florida Keys, protected under the Florida Keys National Marine Sanctuary Act. Because of the high-energy area of the damaged site, experts determined that the seagrass original habitat would not recover for 50–100 years. In order to compensate for the loss of resources during that time, NOAA determined that a viable off-site restoration project would be transplanting seagrass into a no-motor zone boat impacted area. The Judge upheld the use of HEA as an appropriate assessment methodology, found that the proposed project of 1.55 acres of seagrass habitat was similar in scale to the interim loss and entered the damage award for conducting the project, the assessment, the post-project monitoring, and interest. In a more recent case, a Federal Magistrate approved HEA methodology, finding it to be a mathematical equation that works, subjected to peer review and accepted for publication. In this case, HEA was used to measure damage to seagrass and convert that measure into equivalent resources (*US vs. Great Lakes, Dredge & Dock Co.* 97-2510-CIV-DAVIS, 97-10075-CIV-DAVIS [SD FLA]).

While HEA is the preferred methodology, this assessment process, like everything involving NRDA, draws criticism from industry. A team of consultants from ENTRIX, Inc. in Delaware argues against blind adoption of HEA and instead urges a more time-oriented approach, which places compensation projects along a continuum, instead of looking only at the beginning and endpoints as does HEA. Under an Augmented HEA approach, the critics allege that the trustees should consider other restoration alternatives, including low-cost restoration measures and out-of-kind restoration options. The augmented approach could lead to better success in terms of services provided (Tomasi et al., 1999).

Regardless of which methodology is used, since the goal of OPA 90 is to make the public whole, NOAA evaluates natural resources in broad terms, considering how the oil spill interrupts the flow of ecological and human services to people. Wetlands, for example, serve specific ecological functions, such as sediment trapping, shoreline stabilization, fisheries production, waterfowl habitat, biodiversity, carbon cycling, natural open space, all of which create an indirect benefit to humans. In addition, they are a source of human recreation, commercial use such as fishing, historical or cultural use, scientific use such as pharmaceutical, health such as cleaning water and air, providing both direct on site and off site benefits to mankind. On yet another and more controversial level, wetlands have a passive use value, independent of their direct use, for their own sake or as bequests to future generations (NOAA, 1997a).

Only if the resource-to-resource or service-to-service approach to scaling restoration actions is not appropriate may trustees use Contingent Valuation or another valuation methodology. The Contingent Valuation Method is a survey-based approach to determine what the public is willing to pay to preserve the existence of a natural resource, or is willing to accept as compensation if the resource is damaged. Value derived includes the value an individual receives from knowing that the resource will be available for future generations. An assessor establishes a pool of people affected by injury to the resource, tries to select a representative sample of people from that pool, determines through an interview process the average value they are willing to pay to prevent the damage, then multiplies that average by the total population in the affected pool. The end-product, as a specified amount of damage, can be used to scale a restoration project (Barbier, 1996; NOAA 1997a; Olney, 1999). In brief, the international view of the compensatory restoration process is that it is "unreasonable". (For further discussion see Section 4.3.3 of this book.)

Under OPA 90, the responsible party is required to pay all costs, including NRDA costs. There is another source of funding, for emergency response and for damage claims not compensated by the responsible party. This source is the Oil Spill Liability Trust Fund (OSLTF). (See Section 4.3.5 of this book for further discussion of the OSLTF.) Until recently, the OSLTF could not be used to pay damage claims for natural resources, without US Congressional appropriation. In November 1997, the Office of Legal Counsel of the Department of Justice issued an opinion allowing for direct payment of NRDA claims from the OSLTF. The scheme and process for adjudicating

and then administering such claims is in the works. This change will have significant impact on processing future NDRDA claims (USCG, 1998).

An appreciation of the NRDA system and the damages generated from the new rule's application should lead ship owners and industry to some basic conclusions:

- Prevention is the key. Keeping oil out of the water, by adopting a safety culture, avoids the process, which is a process best avoided. OPA 90 is working. NRDA costs and the evaluation of natural resources make people in the shipping industry more careful (Burlington, personal interview, 1999);
- Be ready for spills, use best response, and appropriate, scientifically-based technology to contain the source and effectively clean-up the oil. Maximum protection of affected natural resources in the first place limits the interim loss to the public and accelerates returning the resources to their pre-spill condition. Compensatory restoration costs decrease;
- Implement prudent risk management. This means less interim time between incident and restoration and less involvement in uncontrollable unknowns involved in compensatory restoration models and valuation; and
- Involve Trustees at the beginning of the process. Incorporation into response of the long-term environmental impact approach as opposed to a more short-term, militaristic view of containment and immediate protection will benefit the environment in the longer run and most likely, cost the responsible party less (Burlington, personal interview, 1999).

NOAA states clearly its belief that NRDA not only restores injured resources under the "polluter pays" principle, but that NRDA also provides an incentive for the private sector to prevent injury. A small investment of public funds yields big results, over $200 million in settlements with responsible parties since 1990 (exclusive of *Exxon Valdez* funds) (NOAA, 1998). While critics question the numbers, according to a NOAA study, NRDA has composed no more than 25% of the total costs of a major oil spill incident. Nor is NRDA a part of every oil spill incident. Trustees conduct damage assessments in less than 1% of all cases (Helton et al., 1997).

There are many opponents to the use of NRDA, with the international community voicing the most vocal objections. As will be seen in the following section, these objections stem from a significant difference in outlook about natural resources:

- The US has a public trust doctrine of governments protecting and restoring resources not generally accepted in the global community. While disputed, there may be a movement internationally to assert increasing protection for natural resources (for further discussion see Section 4.3.4 of this book);
- The US has more of a broad cultural and historical background for natural resource valuation and protection. The international community looks at ecological impacts more narrowly. Traditionally, economic impacts are considered part of "doing business"; and

- While natural recovery without human intervention is an alternative considered by US Trustees and the worldwide community, there is strong disagreement about compensation for losses during the interim recovery period (Burlington, personal interview, 1999).

With the concept of "endpoints" being incorporated into the response process, which is oriented more toward a restoration based and possibly more cost-effective approach, there is some movement toward harmonization of US and international oil spill response and greater acceptance internationally of NRDA. However, the basic and underlying fundamental systems of compensation for damages to natural resources continue to branch in almost opposite directions. Because of this difference in policy, unification of the two systems is still far off in the future. There is no apparent weakening of the US's assertion of NRDA claims for oil spills in American waters.

4.3.3. Compensation for Economic/Environmental Damages—1992 Conventions

The international regime for compensation for damages from oil spills is governed by two international conventions and their subsequent 1992 Protocols. The "old regime" is framed by the 1969 International Convention on Civil Liability for Oil Pollution Damage (1969 CLC) and the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (1971 Fund Convention). In 1992, a "new regime" was created by two Protocols amending the two conventions effective 30 May 1996. The amended conventions are known as the 1992 Conventions. Two intergovernmental organizations exist under the Fund Conventions. The International Oil Pollution Compensation Fund 1971 (established October 1978) and the International Oil Pollution Compensation Fund 1992 (IOPC Funds 1971 and 1992) administer compensation for oil pollution damage resulting from spills of persistent oil from tankers (IOPC, 1998).

The Civil Liability Conventions govern liability of ship owners for oil pollution damage on the basis of strict liability (liability without regard to fault) and create a system of compulsory liability insurance. Liability is limited to an amount linked to the tonnage of the ship. The purpose of the IOPC Funds 1971 and 1992 is to compensate victims of oil pollution damage in Member States who cannot obtain full compensation under the Civil Liability Conventions. The Fund Conventions supplement the Civil Liability Conventions, if damages exceed the owner's liability or if the owner is financially incapable of meeting his obligations. Each Fund Convention has an Assembly composed of Member State representatives and an Executive Committee. As a country ratifies the 1992 regime, that State denounces the old. As of the end of November 2000, 62 nations have ratified the 1992 Fund Convention (IOPC, 1998, 1999; Jacobsson, 2001).

The funds are financed by contributions levied on any person or company receiving more than 150,000 tonnes of crude oil or heavy fuel oil in ports or terminal installations in a Member State, after it has been transported by sea. Claims under the CLC

can be made only against the registered owner of the ship concerned or his third party insurer. In the case of a dispute between the IOPC Funds and a claimant, the final arbiter is the national court in the nation state in which the damage occurred. Criminal sanctions are an issue only for the national court (Jacobsson, 1999). The 1971 Fund limits total liability for any one incident to 60 million Special Drawing Rights (about US$80 million). The 92 Fund has a higher limitation of liability for any one incident, with a maximum payable of 135 SDR (about US$173 million), including any sum paid by the ship owner or his insurer under the 1992 CLC (IOPC, 1998). At its 82nd Session in October 2000, IMO's Legal Committee adopted amendments to raise by 50% the limits of compensation by amendments to the 1992 Convention. These increased limits should enter into force by 1 November 2003. For a single incident, the IOPC Fund maximum amount payable is raised to 203 million SDR (about US$260 million). One of the primary challenges for the international compensation scheme is that, as Member Nations ratify the 1992 Fund, the 1971 Fund declines, with a respective decline in the contribution base to the 1971 Fund. The potential negative outcome of this situation is that, before the 1971 Fund can be wound up, there may be an oil spill incident for which there are insufficient funds to pay compensation to the victims. Pursuant to a 2000 Protocol signed 27 September 2000 to the 1971 Fund Convention, that Convention will cease to be in force when the Member States number less than 25 or the total contribution to the Fund by those members is less than 199 million SDR. The expected date for its cessation is 21 June 2002 (IMO, 2000e, f; Jacobsson, 2001).

Significant differences exist between OPA 90 coverage and even between the "old" and "new" regimes. These distinctions impact what type of economic and environmental damages will and will not be compensated and other important elements of liability coverage:

- **Oil covered:** OPA 90—all types. Old regime—persistent oil carried in bulk on laden tankers and bunker fuel from tankers carrying persistent oil cargo. New regime—Adds unladen tankers with persistent residue on board, including bunker oil.
- **For what:** OPA 90—discharge or substantial threat of discharge. Old regime—escape or discharge. New regime—escape or discharge or grave and imminent threat of such discharge.
- **Area covered:** OPA 90—Exclusive economic zone, territorial waters of US Old regime—territory of a party, including territorial sea. New regime—Adds EEZ or equivalent area of a State Party.
- **Parties liable:** OPA 90—Responsible Party, including vessel owner and operator. Old and new regimes. Registered owner.
- **Defenses:** OPA 90—Act of God, war or act or omission of third party. Old and new regimes—Adds negligence or other wrongful act of a government or authority responsible for maintenance of lights or other navigational aids.

- **Breaking limits:** OPA 90—willful misconduct, gross negligence, violation of federal safety, construction and operational regulations, which were the proximate cause of the incident, failure to report, failure to cooperate, failure to comply with orders under Clean Water or Intervention Acts. Old regime—Incident occurred as result of personal fault or privity of owner. New regime—personal act or omission of owner committed with intent or recklessly and with knowledge that damage would result.
- **Limits of liability:** OPA 90—Tanker >3000 gross tonnage, > of $1200/gross tonnage or $10 million; <3000 gross tonnage, > of $1200/gross tonnage or $2 million; non-tanker, >$600/gross tonnage or $500K. Old regime—total compensation payable by the 1971 fund of aggregate per incident limited to 135 million Special Drawing Rights (SDR) (about US$173 million), including the sum actually paid by the ship owner or insurer under the 1992 CLC. New regime—3 million SDR (US$3.8 million) for ship <5000 units of gross tonnage; 3 million SDR + 420 SDR (US$537)/unit of additional tonnage for tonnage between 5K and 140K units; >140K units of tonnage, 59.7 million SDR ($76.5 million US) All sums amended by IMO, effective 1 November 2000: for ship <5000 gross tonnage—4.51 million SDR (US$5.78 million); for ship between 5K and 140K—4.51 million SDR (US$5.78 million plus 631 SDR (US$807) for each gross tonne over 5000: Ship >140K, 89.77 million SDR (US$115 million), IMO (2000e) (K = 1000).
- **Claimants:** OPA 90—Any party, including governments, trustees, private claimant. Old regime—Any party suffering pollution damage (loss or damage caused outside the ship). New regime—Any party suffering pollution damage.
- **Economic damages:** OPA 90—removal costs, real and personal property damages, profits, earning capacity, lost revenues of government, costs of increased public services. Old and new regimes—loss or damage caused outside the ship, including cost of preventive measures, clean-up costs, and economic loss. New regime—adds reinstatement/restoration of the environment at reasonable cost (IOPC, 1998; 1999, Sheehan, 1995). See discussion below.

Recovery for economic damages under the international regimes is more limited than that under the US national scheme. “Pollution Damage” means actual loss or damage caused outside the ship and includes the costs of *preventive measures*. The term *preventive measures* is defined as “... any reasonable measure taken by any person after an incident has occurred to prevent or minimize pollution damage”. Primarily, the term covers clean-up measures, including the disposal of recovered oil and oily debris.

Each claim is subject to a test of “reasonableness”, interpreted to mean that, on the basis of a technical appraisal, the measures would likely minimize pollution damage, would be cost-effective, would not be instigated for the sake of public relations, and would be sized to scale and expected level of success.

The types of claims admissible for compensation, subject to limiting principles are these:

- Damage to property;
- Costs of clean-up;
- Loss of earnings by the owner or user for property contaminated by the spill; and
- Pure economic loss under certain limited conditions (Jacobsson, 1999).

The overriding principle for recovery of property damage is that the claimant's economic position should be no better nor worse than if the spill had not occurred. Only *quantifiable economic loss* is compensated for claimants with a legal right under national law.

These general criteria apply to claims of pollution damage and preventive measures:

- Expense/loss was incurred;
- Measures were reasonable and justifiable;
- Expense/loss was caused by contamination;
- A direct link exists between expenses/loss and damage and contamination; and
- The loss is a quantifiable economic loss supported by proof.

In most cases, clean-up operations and property damage are treated as preventive measures, for example, combating oil at sea, defining sensitive resources, and cleaning structures. These are assessed based on "objective criteria". Costs incurred and the relationship between these costs and benefits should be reasonable (IOPC, 1998a).

Remotely linked losses are not covered. In considering "pure economic loss", loss of earnings sustained by those users whose property was not directly affected by the oil, these criteria apply:

- Geographic proximity between activities and contamination;
- Degree with which the claimant is economically dependent upon the resource;
- Alternative sources of supply or opportunity; and
- The extent to which the business is an integral part of the economic activity affected.

The Funds generally pay for actual losses and not "budgeted figures". The Funds will not advance money for measures to prevent loss until actually undertaken. The Funds do not regard themselves as being in the role of a "claimant's banker" (IOPC, 1994; 1998a).

Compensation for environmental damages is set against a policy framework substantially different from the US system. Unlike the OPA 90 regime, the IOPC Funds do not accept natural resource damages and the cost of assessing such damages, except as to measures of reinstatement discussed below (Jacobsson, 1999). The international regime depends upon consensus among Member States, with the contributors in one state subsidizing an incident affecting another. Unlike the OPA 90 Oil Spill

Liability Trust Fund which works within one country and one federal legal system, the Conventions function in 85 separate sovereign state legal systems, with significant cultural and linguistic differences. "A comparison between the international regime and OPA 90 must take into account the fact that while the Oil Spill Liability Trust Fund works within one nation and one legal system, the IOPC Funds operate in a large number of jurisdictions with different legal systems and varying cultural traditions and languages" (Jacobsson, 1999).

The international approach creates an issue in the area of compensation for economic and environmental damages of how far a Member State is willing to place economic burdens on their oil industry. The global view leads to a reluctance to embrace what is seen as a more open commitment policy, for example, compensation for abstract damages, under the US national system.

The consensus political framework sets the admissibility of claims for environmental damage. These principles govern:

- The goal is to place the person suffering damage in the same economic situation as if the damaging act had not occurred;
- Only a person suffering *quantifiable economic loss* is entitled to compensation;
- The IOPC Fund does not pay damages of a *punitive* character, those calculated on the basis of the seriousness of fault of the wrongdoer;
- Compensation of punitives leads to unacceptable results, such as impacting those suffering measurable quantifiable loss. If the aggregate amount of established claims is greater than the total amount available, then each claim is reduced by the same percentage. The purpose of punitive damages is as a deterrent. The Fund cannot experience a "deterrent" impact;
- Compensation may not be awarded on the basis of theoretical models; and
- The system of criminal penalties of Member States for oil pollution from ships is outside the Conventions, since such penalties do not constitute "compensation" (IOPC, 1994).

The 1992 Conventions codified previous Fund policy that compensation for *impairment of the environment* is limited to "... costs of reasonable measures of *reinstatement* actually undertaken or to be undertaken". While seemingly embracing an approach similar to NOAA's restoration process, again, the international regimes and OPA 90 differ.

Compensation is for *quantifiable* elements only, defined as damage with a value that can be assessed in monetary terms, such as the loss of profit or income to persons depending directly upon income from sea-related activities. *Unquantifiable* elements are excluded, such as damage to the marine environment calculated based upon theoretical models like those used by NOAA. Passive use or intrinsic environmental benefit are not recognized as compensable elements of environmental damage (IOPC, 1994; O'Connor and Mayer, 1998).

The 1992 Conventions qualify admissibility of claims for *reinstatement* of the marine environment using criteria similar to the approach used for economic loss claims. Under the Conventions, damage to the environment is recoverable only if measures, *actually undertaken or to be undertaken*, can restore the environment and can meet fundamental criteria. For any restoration project to be considered reasonable and costs to be recoverable, they must be based on sound science, practically feasible, not disproportionate to results achieved or to be achieved, offering a reasonable prospect of success and not out of proportion to the extent and duration of damage (IOPC, 1994).

The scientific concepts underlying reinstatement or restoration internationally vary from those supporting the US system of Natural Resource Damage Assessment. The starting position of the IOPC Fund is that "... the potential for natural recovery is great and that man is severely limited in the extent to which he can take restoration measures which will improve upon the natural processes" (IOPC, 1994). Reasonable "reinstatement" is subjected to two severe limitations. The first is the natural variability of the marine environment, i.e., nature is in flux, not static and it is hard to define what state the ecosystem would have been in the absence of a spill due to such impacts as El Nino and other natural variances, The second is the inability to determine when a recovered state has been achieved. Man is unable to return the environment to its exact pre-spill condition. Defining what is "as healthy" and functioning as before the incident in terms of species diversity and abundance requires either significant baseline information or extrapolation from a parallel ecosystem similar to that damaged. Differing parameters, such as time of year, weather, effectiveness of response will affect the same environment in different ways, making it hard to define what is recovery and to determine whether an ecosystem is recovered or not (White, personal interview, 1999; Dicks, 1999).

The goal of reinstatement is to speed up the process of natural recovery. In the case of a species with large natural recovery capacity, such as barnacles and limpets, the best response may be natural recovery. In cases where species are threatened or endangered, and reinstatement is feasible, reinstatement activities may be appropriate. For example, minimizing early predator impacts on juveniles of a seabird species may allow protection for a population to flourish and recolonize a damaged area (Dicks, 1999). Under this international view, some US restoration programs are seen as little more than "large experiments". While NOAA trustees may assert that a particular restoration action will have a specified result, in fact there will be considerable uncertainty over the speed and extent of natural recovery and no guarantee that the proposed restoration program will be successful. This is especially so bearing in mind man's inability to control many of the physical, biological and other factors that will affect the recovery process (White, personal interview, 1999).

Unlike the OPA 90 regime, under the 1992 Conventions acquisition of equivalent resources or habitat is not compensable, nor is loss of use or enjoyment of the natural resources, nor loss of services recognized (Brans, 1999; O'Connor and Mayer, 1998). Only *primary restoration*, not *compensatory restoration* for lost services is

compensable under the international conventions. Post-spill environmental studies to determine the extent of the damage and reinstatement needed may be subject to Fund contribution if the reinstatement measures fall within the scope of what is compensable and reasonable. Loss of profit from impairment of the environment is not subject to compensation. (IOPC Fund, 1998).

An analysis of the restoration approach in the case of the 15 February 1996 *Sea Empress* oil spill of 72,000 tonnes of crude oil and 360 tonnes of heavy fuel oil off Milford Haven in southwest Wales (UK) contrasts the differing approaches in US and international restoration actions. While impacts on the marine ecosystem were substantial over a period of many months, including bans on fishing due to oiling from date of incident through September 1997, the ultimate conclusion of the evaluation committee established after the incident was that the ecology as a whole was not harmed.

Counsel for NOAA suggest that this conclusion may have been premature. Although a larger member of the "robust species survived, at least one report suggests that the impacts on the immune systems of many affected species or recolonization of less conspicuous species and overall effect on restoration of the full biodiversity of the shore is likely to take much longer" (O'Connor and Mayer, 1998). The 1971 Fund and the ship owners insurer, the Skuld Club processed claims totaling 16 million pounds for reimbursement for clean-up operations, contamination of property, loss of income from fishing bans, and loss of tourism for services provided directly in the impacted area. Reinstatement activity for the environment was limited to claims from charities and trusts for rescue and cleaning of birds, surveys and monitoring of the coast and shoreline for about 97,600+ pounds. As of December 1998, the IOPC Fund paid out 18,600 pounds of these claims, with inquiries pending as to the balance (IOPC, 1998). No other restoration of the area is contemplated.

A comparison of US policy toward natural resources and International policy leads to the conclusion that *reinstatement of the environment* is a more limited concept under the international scheme. One critic of the Conventions claims that the only actual reinstatement activity undertaken and compensated to date has been replacement of sand on a beach (Brans, personal interview, 1999). Under the current state of IOPC Funds policy it may be more appropriate to characterize "reinstatement" as akin to *clean-up* action. Reinstatement is a relatively new concept for the IOPC Funds. While there is argument in the international community for broadening the concept of natural resource damages, departure from the fixed concept of reasonable measures of reinstatement actually undertaken or to be undertaken for impairment of the environment appears unlikely in the near future.

4.3.4. Change in the International Regime—Compensation for Natural Resource Damages

While the IOPC Funds point to the increasing number of nations ratifying the 1992

Conventions as support for the contention that the objectives of the Funds are being met, even the Director of the Funds recognizes some inherent weaknesses:

- The IOPC Funds set limits lower than those of OPA 90. If a major incident exceeds these limits, then the Funds can make provisional payments only, until all claims are accounted for. They may pay only a pro-rata amount of the total claimed to each victim. Settlement may take a long time, with negative financial impacts upon smaller businesses and individuals;
- The national Court in which the incident occurred is the final arbiter of claims, so that the court is free to adopt or reject the Funds' interpretation of liability. When court action follows after settlement of claims fails, payment may be delayed for a significant time; and
- Solutions to emerging problems under the Conventions are hard to resolve, because the Funds operate in 85 nations with different legal systems, viewpoints, and cultures. The compensation conventions, like other international treaties, are the result of compromise between competing interests and national policies. Change is slow (Jacobsson, 1999).

In his view, however, Mans Jacobsson believes that the fact that a great number of states have ratified the 1992 Conventions shows that the international community in general considers the convention regime viable and satisfactory (Jacobsson, personal communication, 1999).

If the objective is payment of compensation for victims of oil spills, the Funds claim success. Since inception in October 1978 of the 1971 Fund, through December 1998, the 1971 Fund has dealt with 92 incidents, with total compensation paid of more than 191 million pounds (IOPC, 1998).

It is more particularly in the area of environmental damage, that certain individuals in the US and a few nation state members to the compensation conventions urge change, the adoption by the Funds of a more comprehensive outlook for natural resource damages and restoration.

Dan Sheehan, former Director of the National Pollution Funds Center in Washington, DC (and now, Director of Information & Technology, US Coast Guard) has long been a proponent of closing the gap between the US and the Funds regimes. From his experience of more than 20 years in the marine safety field, he believes that the international Funds are moving and will continue to move closer to the American systems in three important respects:

- The scope of damages, including natural resource compensation, will become more inclusive, in large part due to pressure from Member States;
- The limits of liability will increase, because of the current problem of not being able to cover the losses to oil spill victims of larger spills and the need to pro-rate all claims paid; and

- Coverage will be extended to include bunker spills from non-tankers, (vessels not constructed to carry oil) due in part to a strong movement within the International Maritime Organization. The International Tanker Owners Pollution Federation (ITOPF) reiterates this concern, based on two factors: the high percentage of recent oil spill responses from non-tankers and a recognition that bunker spills from such vessels pose a serious threat to humans and the marine environment, which is as great as more publicized tanker spills (Sheehan, personal interview, 1999; ITOPF, 1998). The Legal Committee of the International Maritime Organization forwarded a draft international convention on civil liability for bunker oil pollution damage to diplomatic conference. At the March 2001 Convention, IMO adopted a bunker convention (IMO, 2000e, 2001). While the Bunker Convention awaits ratification by sufficient Member States, Canada has already recognized the importance and significant threat of bunker spills. The Ship-Source Oil Pollution Fund in Canada pays claims for all classes of ships, not just for seagoing tankers or persistent oil: the keystone of the Canada Shipping Act is similar to the US philosophy, the polluter pays (SOPF, 2000).

Again, Mans Jacobsson disagrees, as to natural resource compensation. His position is that few nation states would support the US approach (Jacobsson, personal communication, 1999).

In spite of the IOPC Funds' viewpoint, some concerned individuals and states in the international community are voicing an opinion that the 1992 Conventions are using a definition for environmental damage dating from 1984, which is not in step with the modern environmental movement in several important aspects:

- Damages for pure economic loss or consequential loss from damage to the marine environment are limited to those which are neither geographically nor causally removed from the spilled oil. Fishermen whose nets are contaminated suffer direct consequential loss, subject to reimbursement. Fishermen whose boats and nets are not contaminated, but who are prevented from fishing because of closure of a contaminated area, suffer pure economic loss which may be compensated, subject to geographic proximity and proof of direct dependence upon the environment damaged. But, those who provide goods and services to an industry which in turn provides tourism services may be too remote from the contamination to receive compensation. The difficulty comes in quantifying damages where the claim is based upon claims from hoteliers and others too remote from the direct impacts of the spill (Brans, 1996). In the *Braer* spill, for example, the Funds rejected claims from employees of fisheries who suffered reduced work hours (Brans, 1995).
- Costs of reinstatement of the environment are limited to those which are directly quantifiable. Damage to the marine environment often lacks direct monetary/market value or requires quantification by abstract methodology such as Habitat Equivalency Analysis used in NRDA (see Section 4.3.2 of this book). This lack

of economic quantification should not prevent compensation for damaged natural resources or loss of their services to the public.

- Internationally, most natural resources are not subject to trustee stewardship, like US resources. Lacking "property rights" status, the question of who has standing to bring an action is unclear.
- Where irreparable damage occurs or if restoration activities are disproportionately expensive or impossible, the conventions do not provide for restoration projects such as acquisition of off-site equivalent value resources, as is available in the US, under the Natural Resource Damage Assessment (NRDA) law. Rather, such activities are outside the scope of coverage. This leads to an inequitable outcome "... polluters who cause mild environmental damage pay compensation, (but) polluters who cause massive and irreparable damage pay nothing" 1995).
- The definition of "pollution damage" under the CLC is vague and left to interpretation by a court of a Member State, leading to possible inconsistent results (Brans, 1996).

The 1992 Conventions prohibit use of theoretical models, commonly used in the US regime, to quantify damage. This prohibition eliminates per se damage to the environment, except insofar as reasonable restoration measures are actually undertaken or to be undertaken (IOPC, 1998). The Conventions' definition of natural resource damages rules out recoveries which the national courts of Member States have awarded: in the *Patmos case* (1985) by the Italian Court of Appeal for 830,000 pounds as compensation for loss of value of the natural resources to the public for health, recreation, and other services; the *Haven* incident (1991) for 16.8 million pounds for environmental damage not part of the clean-up costs, including damage to the sea and atmosphere (In part, abstract methodologies to reach compensation were used); and the *Seki* incident, submitted to the Fund by the United Arab Emirates for damage to the marine environment which is considered to be part of that nation's wealth. Damage was constructed in part by use of an abstract method. The argument for change is that the international regime exclusion of damage to the environment per se, where not linked to restoration costs, or where proven by use of abstract methods, seems to avoid the generally accepted principle of the "polluter pays" (Brans, 1995; 1996).

Critics argue that the disparity between the question of admissibility of environmental damage between the IOPC Fund and Member States such as those involved in the cases above could lead to the very outcome which the Conventions are seeking to avoid, i.e., non-uniform application of international compensation regimes. The national court is the final arbiter in the case of a dispute between a claimant and the IOPC Funds (Jacobsson, 1999).

An open question is whether courts in various nations will apply the same interpretation to the wording of the Conventions. Diverging views by nations parties to the Conventions on environmental damage, may result in differing applications of the otherwise uniform guidelines on limits of liability (Wu, 1996). For example, under

French law, the ship owner is required to take all measures necessary to restore the environment, without limitation, including replacing resources when restoration of a site cannot be achieved (Holt, 1995). While the 1992 Conventions eliminate the use of theoretical assessment of intrinsic value for the environment, the national court may still be called upon to define the less imprecise convention terms involved in answering these baseline questions:

- What are reasonable costs of reinstatement;
- What is technically feasible; and
- What expenditures are necessary to rehabilitate the environment?

Set against dissimilar national frameworks, without substantial, developed case law on these issues, yet, the courts may apply non-uniform interpretations of liability and compensation (Brans, 1995).

Claims may be brought outside the Conventions for civil or criminal liability against parties other than the ship owner and its third party insurer under general principles of national law. An example of this type of national action is the *Tanio* case, where the French government brought action under French law against charterers, the classification society and the shipyard that repaired the vessel based upon general principles of negligence, sending the ship to sea in an unseaworthy condition, making improper repairs, and failing to determine the state of repairs (Brans, 1995). Of recent note is the *Sea Empress* decision in which the Judge levied a criminal fine under the Water Resources Act against the Milford Haven Port Authority of $8 million US (later reduced to $US 1.8 million) for the 1996 grounding of the Liberian tanker in the entrance to Milford Haven in the United Kingdom, caused by pilot error and insufficient control procedures by harbor/port authorities (OSIR, 1999).

There is a movement away from the more strictly limited definition of damages in other international conventions, for example the 1993 Lugano Convention (The Council of Europe Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment), which includes in the definition of damage to the environment a reinstatement right to include "equivalent components" if restoration or re-establishment of the impaired environment is not reasonable nor feasible (Brans, 1996). One of the drafts of the liability Protocol to the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal contained consideration of compensation based upon the intrinsic value of the damaged ecological systems, including their aesthetic, cultural values, and loss entailed in the destruction of species where the environment could not be restored to its comparable state. This concept has been deleted in more recent drafts (Brans, 1995).

The possible trend of modernizing the definition of environmental damage and compensation for loss to the environment is most clearly seen in the development of a White Paper on Environmental Liability by the Commission of the European Communities (EC). The paper focuses on damage caused by dangerous activities and on recovery of damage to natural resources. For those natural resources already pro-



By Jeff MacNelly, *Chicago Tribune*, 1989.

tected under Community law, (the Wild Birds and Habitats directives), the proposal is for a fuller recovery of damage, including the loss of public services attributable to those resources damaged by an oil spill. This White Paper is expected to have a significant impact on the future of environmental damage recovery in the international community.

The key elements are as follows:

- Strict liability based upon the "polluter pays principle" for dangerous and potentially dangerous activities; "fault-based" liability for non-dangerous activities;
- No retroactivity for prior environmental damage from effective date;
- Setting of objectives, results, and a minimum standard only, allowing Member States to extend the regime and enact implementing liability rules;
- Encouragement of preventive measures by liability exposure and enhancement of the concept of the "precautionary principle";
- Natural resources must already be protected by Community law, such as flora and fauna and their habitats under EC Council Wild Birds and Habitat Directives;
- Natural resources must have a special value for the public and be clearly identified;

- Liability for damage must be quantified as "significant", e.g., There are changes in growth or reproduction of species, there are changes in the level and quality of human services provided by the natural resources;
- Restoration to baseline (comparable) condition is the preferred damage assessment method;
- Action is directed at compensating the public for the lost value of the injured asset;
- Costs are not to be disproportionate—restoration must be cost-effective and reasonable (survive a cost-benefit test);
- Abstract methods may be used to determine damages where restoration is not technically feasible;
- Valuation is based on cost of alternative solutions to establish natural resources of equivalent value or comparable projects;
- Member States have primary standing to bring action ("first tier"); and
- Public interest groups have a subsidiary right of action ("second tier") (Brans, 1999; Commission of the European Communities, 2000).

The possible inclusion of a right of action for public interest groups in the new EC proposal is a major step. Unlike the US system where the trustees act on behalf of the public, no such representation exists under the international scheme. Right of action belongs to individuals or entities suffering actual, quantifiable harm. Prior to this EC initiative, the public does not have standing to assert claims for loss of use of enjoyment or the other non-monetary benefits provided by an unowned natural resource due to an oil spill. Under the proposed act, public interest groups must meet certain minimum requirements. While their rights are limited, the concept of public empowerment has received an essential boost (Brans, 1999).

There is a basic catch with the EC proposed system. If there is overlap between the future EC regime and the current compensation conventions, (i.e., an accident occurs in a Member State to the conventions and the current compensation conventions pertain), the most probable outcome will be that the convention regimes will apply exclusively and the EC regime will not. In that event, the new types of damages for the natural resources will not be subject to compensation (Brans, 1999). Mans Jacobsson, Director of the IOPC Funds, believes that the EC directive is a "non-starter" as to tanker spills of oil (Jacobsson, personal communication, 1999).

A senior engineer and marine biologist at Det Norske Veritas in Oslo, Norway suggests that even the US NRDA approach and proposed EC liability directive fall short of true reimbursement for the actual damage caused by an oil spill. The current liability methods are anthropocentric, measuring damage only in terms of the loss to humans, "the human use value". The compensation schemes do not address the value of the damage to the interdependent natural systems and habitats in the ecosystems in other than human terms. One proposed approach is to define the ecological components affected, monitor the effects of the oil on these components, determine

recovery time to their pre-spill state, and then to use recovery time as one basis for assessing damages. This approach would reduce the intrinsic value to a number. For example, if a wetlands or coastal zone will take 10 years to recover, the polluter pays $1 million per year for introducing oil into the system. Presently, in most countries worldwide, damage to the intrinsic value of natural resources is not compensable. This analysis is futuristic, given the current liability regimes. The policy question is one which may not be addressed until the distant future (Jodestol, personal interview, 1999).

The future EC liability regime, if ever enacted, may be an important step toward harmonizing the US NRDA process and the Convention regimes and effecting a shift toward a restoration approach. The US approach is far from "perfect" and subject to "formidable challenges" for a truly functioning system. Establishment of an acceptable framework for environmental damage compensation is plagued by problems of over/understatement of damages, lack of refinement of the art of assessing market and non-market losses, modeling, and other difficult issues. Appreciation of public values has its own set of difficulties.

> "First, an understanding of public values is an essential element in determining cost-effective restoration programs that make the public whole, particularly for cases where restoration of injured resources is very costly or not technically feasible. In such cases, substitute resources can be provided to compensate the public. However, determining the appropriate compensation in such cases requires an assessment of the relative values of injured and restored resources. Second, monetary valuation will be used in some cases and is required to assess whether restoration costs are grossly disproportionate to benefits" (Grigalunas, 1998).

There is a call by some members of the international oil spill response community to value damaged, lost, and impaired natural resources, reinforced by the inclusion in the 1992 Conventions of the terms "impairment" of the environment and "reinstatement" of natural resources. In the aftermath of the 1999 *Erika* oil spill, the EC's position of increasing the scope of damages compensable for natural resources has strengthened. Given the motivation of proceedings under national law civilly against third parties and criminally against the ship owner and insurer, vessel owners and operators must face the downside risk of greater scope and size for natural resource damage. The considerations which cause the good operators to act cautiously and prevent spills apply equally to US and international waters. Prevention, preparation for oil spills, containment of the source, and effective and efficient response once a spill occurs may avoid or avert an expanding prospect of damage compensation for natural resources.

4.3.5. Oil Spill Liability Trust Fund/COFRs

OPA 90 authorized access to a $1 billion Oil Spill Liability Trust Fund (OSLTF)

to pay for the costs of removal of oil and damages not compensated by the polluter, including natural resource damages. Most critically, the OSLTF is available to pay claims in the event that an incident exceeds the limits of liability of a responsible party. Initially created under the IRS Code of 1986, access to these funds was not authorized until *Exxon Valdez* led to the passage of OPA 90 (33 USC 2701, et seq.). By Executive Order, administration of the OSLTF is delegated to the US Coast Guard. Since February 1991, the National Pollution Funds Center (NPFC) serves as the independent Headquarters unit conducting such administration. NPFC reports directly to the US Coast Guard Chief of Staff (NPFC, 1998).

The OSLTF was created to accomplish these primary tasks:

- To provide funding to permit timely removal action or mitigate a substantial threat to the US Navigable waters, adjoining shorelines or the exclusive economic zone from oil or a hazardous substance spill from vessels or facilities;
- To provide funding to initiate natural resource damage assessments;
- To compensate claimants, including trustees, for uncompensated removal costs not satisfied by the Responsible Party and for damages in certain categories, including natural resource damage, resulting from an oil pollution incident. These funds may be used to carry out natural resource damage assessments and restoration activity;
- To recover costs from Responsible Parties, up to the limit of each party's liability;
- To provide for administration of the issuance of vessel Certificates of Financial Responsibility (COFRs) for operators of US and foreign flag vessels operating in US waters, who must demonstrate their financial ability to pay for pollution damages; and
- To conduct research and development (NPFC, 1993, 1998).

The OSLTF consolidates liability and compensation requirements from other domestic regimes, including funding support for the Federal Water Pollution Control Act, the Deepwater Port Act, the Trans-Alaska Pipeline Authorization Act and the Outer Continental Shelf Lands Act. Several sources of revenue create the fund. These include a 5 cents per barrel tax collected from the oil industry on petroleum produced in or imported to the United States. This tax has been in abeyance since 31 December 1994. Other funding sources are interest earned on the principal from US Treasury investments, recoveries from responsible parties for clean-up costs, fines and penalties, and funds transferred from the Trans-Alaska Pipeline Liability Fund over time (NPFC, 1998).

The OSLTF has two funds, an Emergency Fund, referred to by the former Director Daniel F. Sheehan as "his check book" (Sheehan, personal interview, 1999). The Emergency Fund is used to initiate natural resource damage assessments and to pay for removal activities, up to an amount of $50 million each year. Reference to this fund is available through Presidential Executive Order without the need for Congressional appropriation. The Principal Fund is used for all other authorized purposes. Use of

fund resources is limited to $1 billion per oil pollution incident, with natural resource damage assessments and claims limited to $500 million of that total for each incident (NPFC, 1998).

Recognized claimants are damaged individuals, the US government, states, territories and commonwealths of the US, foreign trustees, foreign claimants, Indian Tribes, and trustees designated under OPA 90. Trustees are the only persons or entities entitled to seek damages for natural resources. Federal trustees recognized by OPA 90 include the National Ocean and Atmospheric Administration (NOAA) for the Department of Commerce, the Departments of the Interior, Agriculture, Energy and Defense. State access is limited to $250,000 per incident for removal costs from the Emergency Fund (NPFC, 1998). OPA 90 and implementing claims regulations (33 C.F.R. Part 136) form the legal framework for OSLTF claims. (Relevant OPA 90 sections include: Annual Appropriations, Section 1007, Recovery by Foreign Claimants, Section 1008, Recovery by the Responsible Party, Section 1012, Uses of Fund, Section 1013, Claims Procedure, Section 1014, Designation of Source, and Section 1015, Subrogation).

A claimant must first submit a claim for removal costs and damages with appropriate support to the Responsible Party or its guarantor, typically an insurer. If the claim is denied, not fully compensated, or not settled within 90 days from submission, then the claimant may proceed with the OSLTF. Claims which may be submitted first to the OSLTF are those advertised by the National Pollution Funds Center, those made by a responsible party, by the state or by the United States. The NPFC will not handle claims which are the subject of active litigation. Two dates govern the time by which claims must be filed:

- For damages, within 3 years from injury or from completion of a natural resource damage assessment; and
- For removal costs, within 6 years from completion of all removal actions (NPFC, 1993).

Claims are processed in the order received, but they are paid on an "as determined" basis, the order in which they are approved. Claims may be paid within 30 days from receipt of a signed release, constituting acceptance of an offer of settlement from the National Pollution Funds Center to the claimant (NPFC, 1993).

The NPFC uses a team concept for each case. The typical team consists of technical experts, such as a lawyer, claims specialist, financial manager, insurance examiner and others. The Case Team functions as part of the overall response system and works with the Federal On-Scene Coordinator throughout all aspects of the spill. From inception through September 1997, the National Pollution Funds Center has handled over 4000 cases, totaling approximately $284 million (NPFC, 1998).

Certain vessel owners or operators must evidence the ability to meet potential liability from an oil or hazardous materials spill in order to transport chemical and petroleum-based products in US waters. Tens of thousands of vessels have the potential for discharging pollutants into navigable waters or adjoining shorelines of the

US. The Department of Transportation issued a Final Rule on 7 March 1996 requiring such vessels to have in place a Certificate of Financial Responsibility, issued by the National Pollution Funds Center, certifying the financial responsibility of the vessel owner and operator (61 Fed. Reg. 9264, codified at 33 C.F.R. Parts 4, 130, 131, 132, 137 and 138 (1998)). Section 1016 of OPA 90 applies to these types of vessels:

- Vessels over 300 gross tons, using any place subject to US jurisdiction;
- Any size vessel using the waters of the exclusive economic zone to transit or lighter oil destined for a place subject to US jurisdiction; and
- Unless a vessel can demonstrate the ability to meet removal costs and damages from an incident by an acceptable form of guaranty, that vessel may not trade in US waters. Further, the vessel may be detained, seized, or forfeited at a US port and the owner/operator may be subjected to a penalty of up to $27,500 a day. NPFC, 1998).

Immediately after the announcement of the Final Rule, industry threatened that oil shipments to the US would stop due to projected prohibitive costs of approximately $415 million to obtain financial guarantees from commercial insurers. This threat was not actualized. The actual cost per year for industry to meet COFR requirements is significantly less, $136 million (Maillet, 1999). Consequently, as of fiscal year end 1997, over 19,100 vessels carry valid COFRs (NPFC, 1998).

By one set of standards, OPA 90, with its "polluter pays" policy is a success. Liability and compensation act as deterrents. Insurance exists to ensure that there is adequate funding in the event of a spill. The mechanism is in place to make private sector funds available for clean-up and restoration. Damages are paid. Recovery from Responsible Parties by the OSLTF exceeds $41 million to date (MSC, 1999, and Sheehan personal interview, 1999). According to an ongoing study of the OPA 90 rule-making projects, the responsibility requirement (COFRs) appears to be one of the most effective rules (Scheer, personal interview, 1999).

The following figures support the position of the US Coast Guard, National Pollution Funds Center, and other proponents that the liability and compensation regime of OPA 90 is a marked win:

- Decrease by 50% in the average number of oil spills over 10,000 gallons from pre-1991 levels;
- Reduction by 50% in the gallons spilled per million gallons of oil shipped (10 gallons spilled per million shipped pre-1991 decreased to 5 gallons spilled per million shipped post-1991);
- No spills over 1 million gallons since 1990; and
- Peak in the total volume of tank ship oil spills pre-1991, remaining below 200,000 gallons since 1991 (MSC, 1999).

In spite of these positive results, there are significant near-future challenges for the OSLTF:

"1 billion dollars just isn't what it used to be", comments Daniel Sheehan, former Director of the National Pollution Funds Center (Sheehan, personal interview, 1999). What this comment refers to is the strong belief by those involved with the fund that another large spill like *Exxon Valdez* might well exhaust the resources available in the current fund for clean-up and compensation. *Exxon Valdez* cost nearly $3 billion. A recent Preparedness for Response Exercise Program (PREP) exercise in Philadelphia generated potential large spill clean-up costs in the range of $10 million a day. Clearly, the Emergency Fund amount of $50 million is insufficient, as evidenced by the expenditure in one year alone on one spill, the *Morris J. Berman*, in 1994 of $49.6 million from the Emergency Fund. "In 1998, over 276 billion gallons of oil were shipped in and around the United States" (MSC, 1999). With no decrease in consumer demand for oil, and the current cost structure of response, a catastrophic spill would have severe negative impact on access to funds to support clean-up, pay claimants, and restore natural resources. The solutions suggested to redress the funding problem are several fold:

- Raise the Emergency Fund cap from $50 million to $100 million, or make the Principle Fund accessible for this use as well;
- Reinstate the taxing authority, as proposed by the President in his 1999 Federal budget;
- Reinstate the authority to borrow from the Treasury's General Fund;
- Raise the cap for each incident from $1 billion;
- Create a 2 cents per barrel tax without a limit, replacing the 5 cent per barrel with its current cap; and
- Raise the level of funding for the OSLTF from $1 billion to $5 billion (also included in the 1999 Presidential budget) (MSC, 1999; Sheehan, personal interview, 1999).

Another challenge for the OSLTF is the processing of the high volume of claims during and after a spill, and the need for an integrated cost accounting system. While finance is one of the components of the structure included within the Incident Command System, there are many stakeholders involved in every oil spill response, governments, private sector, and a combination of public/private interests. The Federal On-Scene Coordinator needs billing and accounting records to know that the Responsible Party is charged for all costs up to its limit and to know when the limit will be exceeded. The Responsible Party must track all costs of subcontractors and coordinate with the Federal On-Scene coordinator to control costs in accordance with an approved clean-up plan. States and municipalities impacted by the spill need to work within the constraints of their contingency plan and coordinate with the Federal On-Scene Coordinator regarding daily costs and claims for losses.

The suggested solution to this accounting nightmare is a standardized system, with standardized documentary forms, nomenclature, and reporting. The US Coast Guard would use a central command system to monitor and receive all such data. The

National Pollution Funds Center (NPFC) is exploring the development of an overall data-capture system to capture such financial information and other elements one time and then provide common access to the data for all user organizations (Sheehan, personal interview, 1999; Sheehan, 1999; MSC, 1998).

At least one study conducted by a team of industry consultants and US Coast Guard personnel supports strongly the need for better control of response costs, which might be paid ultimately by the OSLTF and for a better cost accounting system to monitor and control costs. The study makes several recommendations, to be effectuated by the US Coast Guard and/or the National Pollution Funds Center:

- NPFC should identify economic disincentives to cost control and then, develop procedural and legislative solutions to identify spill costs systematically and minimize expense;
- The Federal On-Scene Coordinator should track costs by an established methodology and manage resources cost effectively; and
- NPFC should establish a procedure and then staff administration of the system with sufficient personnel to handle third party claims through disinterested managers, like those from NPFC (Bettencourt, 1999).

A Department of Justice opinion issued in November 1997 reversed a US Comptroller General opinion of 1995 and interpreted OPA 90 as allowing payment of claims for natural resource damages directly from the OSLTF without Congressional appropriation. This Department of Justice opinion places the burden on the National Pollution Funds Center to develop the adjudication process for those claims. Development of this review process is not an easy task, given the complexity of Natural Resource Damage Assessment claims, the scope of restoration activities encompassed by the US scheme, and the fiduciary, fiscal responsibility of the National Pollution Funds Center. The former director predicts a slow down in payment of NRDA claims. "We will have to review the whole administrative record. We will not take a claim submitted and just issue a check to the trustee. Reviewing the record could slow down the payment process" (Sheehan, personal interview; MSC, 1998).

Other claimants involved in the process today speak of an already slow system of compensation and of the financial difficulties experienced in being paid for clean-up costs. Mark Miller, former President of the second largest response organization in the US, National Response Corporation, criticizes the National Pollution Funds Center for what he characterizes as taking the Atone and demeanor of a Plaintiff's attorney. Mr. Miller uses an example of a fully documented claim with action taken in accordance with directives of the Federal On-Scene Coordinator. Turnaround time from submission to payment took as much as 18 months and the intervention of a state Senator. In many cases the center is seen as "brow beating" the smaller businessman into accepting a settlement of less than full compensation. Mr. Miller questions how small response contractors can stay in business given the Center's aggressive approach (Miller, personal interview, 1999).

Dan Sheehan (formerly) of NPFC counters with this explanation: the situation described is referred to as a "stiffed contractor claim". In this circumstance, a removal contractor has a contract with a responsible party, who refuses to pay all or part of the clean-up contractor's costs. Under this contract dispute, the contractor can submit a claim to NPFC. NPFC often pays and then collects from the responsible party. But, such payment will not be made by NPFC without adequate proof of the contractor's claim. As an alternative, the contractor can sue the responsible party directly. Many contractors prefer the option of pursuing compensation from the NPFD (Sheehan, personal interview, 1999).

The financial capacity of the private responders to continue their business, absent the large *Exxon Valdez* type spill, is of concern to the NPFC. Many of the smaller responders are not receiving retainers from their industry clients to maintain a constant state of readiness and are having trouble staying in business. One proposal is for the OSLTF to pay for the costs of these responders to be involved in required PREP exercises. Such funding could only occur through Congressional action (Sheehan, personal interview, 1999).

Perhaps one of the greatest failures of the OSLTF was the earmarked $20 million set aside for Research and Development. The purpose of this portion of the fund was to create an interagency, Federal project to develop a coordinated approach and undertakings for research and development of oil pollution issues. While innovative, little or nothing has come to fruition from this idea. At about the same time as OPA 90 was enacted, Congress passed the Budget Reconciliation Act of 1990. Essentially, the effect of the Budget Reconciliation Act was to cancel use of this earmarked fund. Due to the spending caps imposed, any of the $20 million budget would compete with and be offset against other budget items of an agency. The net outcome has been a lack of real research using OSLTF at a time when the demand for coordinated research has never been greater (Sheehan, personal interview, 1999).

While there are significant challenges ahead for the OSLTF and policy decisions to be resolved, the liability and compensation scheme of OPA 90, as funded and enforced through the fund, appears to be contributing to the ultimate outcome, prevention of oil spills, funded clean-up and payment of compensation to claimants, including trustees of the public's natural resources. With better cost accounting and standardized mechanisms to manage response actions, through the help of the qualified teams of the OSLTF, "best response" may be one step closer.

4.3.6 Civil Liability

Civil or criminal sanctions resulting from administrative or court action are principal motivators for those in the chain of responsibility to prevent spills and then, use best response to mitigate their damage. Aggressive action by US regulators and judicial

enforcers is focusing the attention of domestic and international shippers of oil upon solving the human error, technological and other problems causing spills.

US Federal and state environmental statutes contain a broad range of enforcement tools to ensure compliance with the laws protecting US waters, or affecting US flag vessels in foreign waters. While the shipping industry has shifted its attention to those rules and laws applicable to criminal environmental enforcement (which are discussed in the next two sections), civil actions are an effective deterrent to avoid oil spills and to compensate those who are damaged from them. In the US, the principle schemes for compensation for economic, property, and natural resource damages, including public resources for which trustees can bring a civil action, are those created by OPA 90 and other environmental statutes.

Internationally, the 1969 International Convention on Civil Liability for Oil Pollution Damage and the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, the 1992 Conventions, and national legislation by countries who are Member States to these conventions create civil coverage of damages. Except in a general way, these conventions and natural resource damages will not be discussed in this section. (Refer to Sections 4.3.2 and 4.3.3 of this book for more discussion of damages recoverable by civil action for wronged parties.)

As a general statement, US federal and state environmental statutes and regulations (many of which are highlighted in Section 4.3.7 of this book) include these enforcement rights:

- Civil penalties ranging from $10,000 to $50,000 per violation or day of violation;
- Administrative orders to respond or abate, enforceable by civil and criminal sanctions;
- Civil action for relief, including prohibition or mandatory injunction (to prevent or stop actions) enforced by judicial decree;
- Citizens' civil actions to compel compliance with or collect damages for violation of the statute" (Sullivan, 1999); and
- Natural resource damage assessments, including restoration, replacement or acquisition of equivalent resources, costs of response, clean-up, and third party claims under OPA 90.

Specifically, there are new Class I and Class II penalties for violations of the Clean Water Act, as amended under OPA 90, (US Coast Guard Oil Pollution Act of 1990 Update, 15 October 1993), for oil discharges under Section 311(b)(3) or as a result of a failure to comply with contingency/vessel plans under Section 311(j), failure to comply with a removal order, or failure to comply with the financial responsibility requirements of the COFR section of OPA 90. The US Coast Guard has the authority to adjudicate OPA 90/Clean Water Act violations through non-adversarial administrative hearings for Class I actions, or for the more severe violations, using a "Judicial Civil Penalties" forum for Class II actions. These violations (listed below) are more

time consuming in their pursuit, but the impact of the increased penalties is believed to be an effective deterrent:

- Maximum Class I—for discharge/plan violation— $10,000 per violation up to $25,000. These penalties are issued, usually, after an administrative hearing in which the responsible party can conduct a defense; and
- Maximum Class II—for discharge/plan violation— $10,000 per day of violation up to $125,000. An administrative law judge holds this type of hearing. There are limited rights for filing motions before the hearing, and for limited discovery. Appeals may be taken within 60 days after the final order is served on the responsible party and are made to the US Coast Guard Commandant.

Alternatively, the civil penalty scheme of OPA 90, that applies to owners and operators of vessels or to those in charge of facilities, provides for the federal government to pursue larger civil penalties in the appropriate US District court in which the governmental authority can acquire jurisdiction, i.e., where the responsible party is located, resides, or is doing business. Penalties for such violations are these:

- Oil discharges can be subject to $25,000 per day or up to $1000 per barrel discharged;
- Gross negligence/willful misconduct in the discharge increases the penalty to a minimum of $100,000 per day or $3000 per barrel discharged;
- Violation of a removal order (Presidential orders regarding discharges)—$25,000 per day or three times the costs incurred by the Oil Spill Liability Trust Fund for failure to comply;
- Contingency plan/vessel plan failure—$25,000 per day. This applies to any person, not just the vessel owner, operator or facility owner/operator.
- There is a "fast track resolution" by the US Coast Guard for smaller violations: for spills of 100 gallons or less, for regulations with penalties imposed of no more than $2500; and
- Failure to comply with COFR requirements—up to $25,000 per day.

The trier of fact, either a Judge or administrative official, will consider certain factors in imposing penalties: "... the seriousness of the violation, the possible economic benefit to the violator, the degree of culpability, prior violations, efforts of the violator to mitigate or minimize the effects of the discharge, and the economic impact of the penalty on the violator" (Olney, 1999).

When the Environmental Protection Agency (EPA) assumes control over a spill, particularly for inland waters spills or facility or other spills on land, OPA 90 amendments to the Clean Water Act provide that EPA is authorized to administer civil penalties:

- Class I discharge—$10,000 per violation— $25,000, maximum;
- Class II discharge—$10,000 per day up to $125,000;

- Judicial action may be taken in the alternative for fines of up to $25,000 per day or $1000 per barrel;
- Judicial action for willful misconduct—Not less than $100,000, nor more than $3000 per barrel; and
- States have the right to initiate actions for similar violations, which in some cases contain higher standards, as for example, the obligation to notify "immediately" after a spill (Olney, 1999; Etkin, 1998).

Criminal enforcement authorities may consider using non-criminal alternatives to prosecution, if the case justifies such a proceeding. Under the United States Attorneys' Manual, Principles of Federal Prosecution for the US Department of Justice, Section 9-27.250 allows for a non-criminal alternative to criminal prosecution if that alternative is adequate to address the perpetrator's conduct. Whether or not the Department of Justice pursues alternative civil action depends upon considerations like (1) how effective the non-criminal sanction will be; and (2) will such sanctions be adequate to address the conduct in question (Linsin, 1996).

US citizens may challenge settlements reached between the responsible governmental agency and the polluter, on the grounds that the penalty is insufficient to deter future violations. In a recent US Supreme Court decision, the US Supreme Court confirmed this right for citizen groups, Friends of the Earth and Citizens Local Environmental Action Network. These groups brought an action as interested parties against the polluter and later challenged the sufficiency of a court imposed civil penalty entered against the defendant, who repeatedly discharged mercury into a South Carolina river. The US Supreme Court set the standard against which the adequacy of a civil penalty is measured, based on its deterrent effect. Is the penalty adequate " . . . to deter future violations and thereby redress the injuries that prompted a citizen suitor to commence litigation". The Supreme Court affirmed the right of citizens adversely affected to bring suit against a polluter and to challenge the civil penalty ultimately imposed by the court. *Friends of the Earth, Inc. v. Laidlaw Environmental Services (TOC), Inc* (98-822) 149 F. 3d 303, reversed and remanded, _ US _ (2000)

Civil penalties under OPA 90 and the other maritime related environmental statutes are but the tip of a very large cost iceberg. The real cost to the polluter comes from the OPA 90 and (under the international conventions) provisions that assess direct and indirect costs of the spill, from clean-up and removal to damage to the natural resources (or reinstatement of the environment in international oil spills). The clear message of potential civil action for the ship owner/operator is to act prudently: to take the necessary preventive action possible, to adopt the safety culture, to focus on the human element, to comply with the letter and intent of international treaties, and to avoid the spill. Money spent in implementing the safety culture is well spent when viewed from the civil, and then criminal penalty enforcement perspective.

4.3.7. Environmental Crimes

The emerging legal theme for the millenium is "environmental crimes". Oil spills have become serious business in the US and internationally. Management at the top is becoming the target of criminal investigation. Responsibility for spills affects not only the lowliest mate. Liability touches the Chief Executive Officers of the Responsible Party (RP) company, subjecting individuals at all levels to potential imprisonment and large fines. The *Morris J. Berman* oil spill in San Juan, Puerto Rico of almost 798,000 gallons of No. 6 diesel fuel resulted in the largest criminal environmental fine in US history, $75 million dollars, the seizure of some $19.5 million dollars in assets of the three individual companies involved and also of the parent company, and house arrest of the managing agent (*US v. Bunker Group,* No. 95-84 (HL) (D. P.R., 25 September 1996). The agent's sentence was later overturned on evidentiary grounds, but the legal doctrines affecting the liability and assets of the corporations remain settled law (*US v. Rivera*, 131 F. 3d. 222, (1st Cir. 1997) (see discussion below). In December 2000, in the US, a $USD 83.5 million civil settlement was reached between the Caribbean Petroleum Corporation, Metlife Capital Corporation, and Water Quality Insurance Syndicate, $USD 60 million of which will reimburse the Oil Spill Liability Trust Fund (DOJ, 2001).

Aggressive litigation on the part of the US Department of Justice (DOJ) and individual state environmental crimes departments has led to numerous actions, fines and sentences: for example, the *North Cape* spill in Rhode Island on 18 January 1996, with its resulting $7 million dollar criminal fine against three companies, additional $1.5 million payment to purchase ecologically sensitive land, $1 million to upgrade safety on ships, $20 million in clean-up costs, and probation for the company president of Eklof Marine and Master of the *Skandia*; (*US v. Eklof Marine Corp*, No. 97-075 (D.R.I., 25 September 1997), No. P2-97-3244-A (RI Super. Ct., 1997); the Royal Caribbean Cruise Line case with its $8 million criminal fine for the Puerto Rico Case and $1 million criminal fine for the Miami, Florida case (*US v. Royal Caribbean Cruises, Ltd., et. al.,* Crim. No. 96-333 (PG) (D.P.R.), Crim. No. 98-103-CR-Middlebrooks, S.D. Fla.1996), the fine of $18 million for more statutory violations against RCCL (OSIR, 1999b), and the latest against RCCL for pollution activities in Alaska leading to a $3.5 million settlement (OSIR, 2000a).

Internationally, various courts have entered a series of fines and imprisonment orders for environmental offenders, even including criminal proceedings against senior harbor managers and the port authority of Milford Haven for the 1996 *Sea Empress* grounding in Wales around the Milford Haven port and subsequent 21 million gallon crude oil spill. The Port Authority was fined $8 million (OSIR, 1999e). This fine was reduced at a later date to US $1.8 million (OSIR, 2000). For other cases and environmental criminal actions affecting oil polluters, see Appendix IV, a table summarizing recent cases.



By Gary Brookins, *Richmond Times Dispatch*, reprinted in *The Tribune*, April 22, 1989.

Felony imposition for an environmental crime is relatively new. Until the passage of the Federal Clean Water Act (33 USC Section 1251–1387), (CWA) in 1972, environmental statutes on the books were not enforced actively. With the increasing public concern over the environment, manpower and monetary resources were allocated to federal criminal enforcement efforts. In the 1980s, actions focused on corporate and not individual activity. Most criminal charges were land based, not marine based. In the 90s, after *Exxon Valdez* and with the enactment of OPA 90, the field of environmental crimes changed substantially:

- OPA 90 extended criminal sanctions to unintentional discharges, applying criminal penalties to negligent or knowing discharges;
- OPA 90 amended the Clean Water Act to increase penalties for discharges of oil and hazardous substances, including imposing felony penalties;
- The Department of Justice, one of the central US authorities charged with prosecuting environmental crimes under its Environmental Crimes Section, came to view this legislative message as a mandate to bring the marine industry into the world of enforcement previously applied to the land-based industry. DOJ instituted an effort to develop closer coordination between the US Coast Guard and DOJ in the enforcement of environmental criminal laws;

- States and territories, like Puerto Rico, began their own environmental regulatory programs, through their own enforcement units. The focus of attention moved to include marine as well as land-based crimes (Russo, 2000; Solow, personal interview, 1998; Barrett, 1998).

The result of this shift in attitude is that there are now eighteen Federal environmental statutes with criminal sanctions, which courts can use to impose penalties against both organizations and individuals. The fines and/or imprisonment range from misdemeanor to felony violations and vary in daily amounts between minimums to maximums of $250,000 for individuals and $500,000 for organizations for each incident. Second offenses can cause the fine to double. Alternatively, for many crimes, Judges can assess fines of up to twice the profits gained by the perpetrator or twice the loss to the victims caused by non-compliance (Alternative Fines Act, 18 USC Section 3571(d) (Supp. 1996) (Adams, 1999). Criminal actions can mean financial ruin for a company, because, generally, insurance company or Protection & Indemnity contracts except coverage for gross or willful negligence or intentional acts. (For more information see Section 4.1.4 of this book.)

Conviction may mean imprisonment of individuals, including company officials for any amount of time, from 0 days up to 5 years and 3 months, depending on the type of crime. The United States Sentencing Commission Guidelines Manual, Chap. 2Q contains a specific section regarding environmental violations and provides for prison terms for individuals convicted. Courts may refer, as well, to the Organizational Sentencing Guidelines, 1991, for imposition of restitution or probation for organizations, although there is no specific environmental crimes section in these guidelines (Adams, 1999). With the exception of two strict liability misdemeanor statutes, environmental criminal laws require knowledge or other evidence of criminal intent, known as *mens rea. More specifically, a perpetrator has "wrongful purpose, guilty knowledge or willfulness which amounts to a criminal intent"* (Russo, 2000; Sullivan, 1999; Solow, personal communication, 1999).

For purposes of oil pollution enforcement, the following are the most used Federal environmental statutes with criminal provisions:

- **Clean Water Act and OPA 90:** OPA 90 amendments to the Clean Water Act (Section 4301(c), amending 33 USC Section 1319(c)) increase the penalties, fines and possible jail sentence based on the severity of the discharge.
  1. Negligent discharge: $2500—$25,000 per day, imprisonment—up to 1 year. Second conviction doubles penalties;
  2. Knowing discharge—$5000—$50,000 per day, imprisonment up to 3 years. Second conviction doubles penalties;
  3. Knowing discharge and placing another person in imminent danger of death or serious bodily harm—$250,000 maximum, imprisonment—up to 15 years for an individual. For a corporation—maximum fine of $1 million. Second offenses double penalties.

4. Failure to Notify is also a crime under Section 311(b) (5) of CWA—$250,000 maximum fine, imprisonment—up to 5 years for individuals. Maximum fine of $500,000 for organizations (Olney, 1999; Barrett, 1998).

- **MARPOL 73/78 and APPS (Act to Prevent Pollution from Ships)** (33 US C. Section 1901—1911): The US implemented the criminal and other provisions of the International Convention for the Prevention of Pollution from Ships, 1973 and its 1978 Protocol (see Section 4.2.1 of this book for MARPOL discussion) by enactment of APPS, which provides for civil and criminal penalties for MARPOL 73/78, APPS and US Coast Guard regulations implementing these laws. The provisions apply to US flag ships wherever found in the world and to foreign flag vessels operating in US waters. APPS adopts the MARPOL 73/78 requirement that the vessel maintain an Oil Record Book, to log all discharges, disposals and transfers of oil. Knowing violation of any provisions of MARPOL 73/78 and implementing regulations including discharges and reporting/record keeping requirements carries a general felony criminal provision of a $250,000 fine for individuals, $500,000 for corporations, and imprisonment of up to 6 years for individuals. There is a "whistle blower" reward for any person providing information leading to conviction of up to half the fine (Linsin, 1996; Barrett, 1998).
- **The Marine Protection, Research, and Sanctuaries Act of 1972:** (33 USC Sections 1401–1445) (Ocean Dumping Act): Amended in 1992, the primary purpose of the Act is to protect the oceans from materials which adversely impact human health or the marine environment. Material is defined as "matter of any kind or description". Knowing dumping without a permit is a felony with penalties of $250,000 fine for individuals, $500,000 fine for corporations, and/or imprisonment—up to 5 years, and possible forfeiture of the vessel. Alternative fines can be twice the gain derived or twice the loss sustained by another party (Linsin, 1996; Barrett, 1998).
- **Rivers and Harbors Act of 1899:** (33 USC Section 407) (Refuse Act): This is a federal misdemeanor pollution statute that can be used for prosecuting vessel pollution. Historically, it has been used more often for land-based facility offenses. It prohibits throwing, discharging or depositing any refuse of any kind from a vessel in navigable US waters. Sanctions include fines of up to $100,000 for individuals, $200,000 for corporations, imprisonment from 30 days to 1 year or alternatively, twice the gain or twice the loss to another party. There is a reward provision for those who report violations of the law to the proper authorities (Linsin, 1996; Barrett, 1998).
- **Migratory Bird Treaty Act:** (16 USC Section 703): This is a treaty interpreted in and since the *Exxon Valdez* oil spill to apply to migratory birds killed by oil spills. Use of this treaty is one of the most bitterly contested issues for industry in the environmental crimes area, because criminal intent is not required for conviction. The Act makes it illegal to kill migratory birds "by any means, and

in any manner". Unintentional discharges are actionable, subjecting violators to misdemeanor penalties: $5000 fines for individuals, $10,000 for organizations, and/or imprisonment up to 6 months, or alternatively, twice the gain or twice the loss sustained by a third party (Barrett, 1998).

- **Comprehensive Environmental Response, Compensation and Liability Act** (CERCLA) (42 USC Section 9601, et seq.: CERCLA imposed liability upon ship owners/operators of vessels for a release of a hazardous substance, including oil, amongst the more than 700 substances listed. The polluter must pay removal costs and damages to the natural resources. Reporting of the release is required. Criminal fines of up to $250,000 for individuals and $500,000 for organizations, and imprisonment of up to 3 years are sanctions for failure to report a release (Barrett, 1998).
- **False Statements Act:** (18 USC Section 1001): As discussed more fully in the next section, this is another area bitterly contested by industry. It is a felony for any person to willfully and knowingly make a false statement or representation, which is material, or to use a document known to contain a false entry, such as a log book, in a matter over which a federal agency, like the US Coast Guard has jurisdiction. Sanctions for this felony include $250,000 for individuals, $500,000 for corporations, imprisonment up to 5 years, with an alternative fine of up to twice the gain or twice the loss (Barrett, 1998).
- **Seaworthiness Statute:** Warranty of seaworthiness under maritime statutes, (46 USC Section 10908): A person knowingly sending a vessel to sea in an unseaworthy condition that "is likely to endanger the life of an individual" violates this statute. Sanctions for the responsible person are $1000 fine, imprisonment for not more than 5 years, or both. This is an area as well undergoing strict scrutiny by the oil shipping industry because of its broad policy applications (Linsin, 1996).

There are other federal environmental statutes or maritime statutes applicable to and used for environmental criminal enforcement, such as the Ports and Waterways Safety Act of 1972 (Pub. L. 92-340, 33 USC Section 1232 for enforcement programs) and the regulations promulgated thereafter, (33 C.F.R Parts 160-168 of, Subchapter P), but the statutes cited above are the most frequently used by the regulatory authorities charged with their enforcement.

Agencies with such regulatory/enforcement authority include:

- The *US Coast Guard* has broad authority to "make inquiries, examinations, inspections, searches, seizures, and arrests upon the high seas and waters over which the United States has jurisdiction, for the prevention, detection, and suppression of violations of laws of the United States" (14 USC Section 89(a)). A boarding may, in some circumstances, take place without a "reasonable suspicion", but if a routine inspection leads to such a suspicion, an expanded inspection can take place and the US Coast Guard can use "all necessary force to compel compliance", including vessel seizure. A search warrant may not be necessary because

of the ability of the ship to move out of US waters quickly while the warrant is being sought (*United States v. Maybusher*, 735 F. 2d 366, 372 (9th Cir. 1984)). In the case of *US v. Varlack,* 149 F.3d (3rd Cir. 1998), this right of warrantless search was extended even to a vessel in drydock, where there was reasonable suspicion to believe that a violation of a US environmental criminal law occurred.

OPA 90 expands this US Coast Guard jurisdiction to investigate a marine casualty. A US vessel or foreign vessel in navigable waters in the US involved in a marine casualty causing significant harm to the environment or materially affecting the seaworthiness of the vessel in the US Exclusive Economic Zone, must report the incident to the US Coast Guard (46 USC Section 6101(a)(5)). Vessels have a duty to report to the US Coast Guard any marine casualty involving death, serious injury, loss of property, or material damage affecting the seaworthiness of the vessel (46 USC Section 6101 (a)). The US Coast Guard is granted further authority to investigate accidents affecting the safety or environmental quality of ports, harbors or navigable US waters under the Ports and Waterways Safety Act (33 USC 1227(a)) (Dickman, 1997; Williams, 1997).

- *The Customs Service* has broad authority to inspect and search a vessel, and may board at any time when a vessel is in US waters. Searches may be conducted without a warrant and even without reasonable suspicion due to the right of the Service to conduct a "border search". Searches on the high seas require a "reasonable suspicion" of violation of a US law (Barrett, 1999).
- The *Federal Bureau of Investigation* has jurisdiction to conduct an investigation of alleged crimes involving a US citizen on US vessels anywhere and foreign flag ships in US waters, if the vessel departed from or is headed toward a US port. International comity usually requires that US officials seek permission of the Flag State before boarding a foreign flag vessel on the high seas (Barrett, 1999).
- Investigations may be performed by any number of officials from different government agencies under the federal and state environmental crimes statutes, including, "... the Environmental Protection Agency, the US Coast Guard, the Minerals Management Service (usually for off-shore drilling rigs), the Federal Bureau of Investigation, the US Fish and Wildlife Service, the United States Attorney with jurisdiction over the incident, the Department of Justice Environmental Crimes Unit, a state environmental agency, or a state attorney general. Any spill, but particularly large spills, can generate multiple and simultaneous criminal and civil investigations" (White, 1999).

The Department of Justice works closely with the US Coast Guard. While the US Coast Guard can refer a case to the Department of Justice (DOJ) for prosecution where there is significant environmental harm or culpable conduct of the responsible party, DOJ can act on its own to bring a case against an alleged violator without a referral from the US Coast Guard and/or with minimal US Coast Guard involvement (Barrett, 1999). What is important for the conduct of investigations and eventual prosecutions

of environmental crimes is the current coordination between the US Coast Guard and DOJ from the inception of an incident that looks like a crime. The US Coast Guard will confer for guidance and advice and work together with DOJ prosecutors, utilizing their specialized knowledge and experience, from the earliest stages of an investigation (Williams, personal interview, 1998; Solow, personal communication, 1999).

In July 1997, the US Coast Guard issued Commandant Instruction M16201.1, "Criminal Enforcement of Environmental Laws" (CMDT Instruction) to deal with the increasing involvement of the US Coast Guard in criminal investigations and penalties. Industry responded strongly to the CMDT Instruction. Some industry representatives were concerned that the US Coast Guard and DOJ were conducting an onslaught against ship owners and operators, and that the CMDT Instruction was put out as part of this "blitz". Capt. Williams, former Chief of the Office of Maritime and International Law of the US Coast Guard, explains the reasoning for the guidelines in response to these charges. The instruction was designed for three basic purposes:

- To educate the US Coast Guard investigators in the various Marine Safety Offices likely to encounter criminal law situations so that they gained heightened familiarity with what the criminal laws were, their elements, and how to conduct a criminal investigation. Previously, the prime focus of marine safety officers was upon regulatory regimes and civil penalties;
- To create a uniform approach throughout the US Coast Guard so that incidents wherever they occurred would be handled in the same manner; and
- Finally, and most importantly, the purpose was to identify the types of incidents the US Coast Guard would target, given limited resources available and the policy of the US Coast Guard to refer those criminal cases to DOJ in situations which "best serve the Coast Guard's law enforcement responsibility by promoting compliance with the law, protecting the public health and welfare, and protecting marine resources" (Williams, 1997; personal interview, 1998).

What has emerged from application of these many environmental laws are two basic legal theories which justify imposition of criminal and civil liability flowing up the chain of responsibility to those at the very top of companies: (1) *the responsible corporate officer doctrine*, a potential criminal violation and (2) a *stockholder derivative right of action*, a potential civil action, against corporate directors (Adams, 1999). A leading case on *the responsible corporate officer doctrine* is that of *US v. Iverson,* 162 F.3d. 1015 (9th Cir. 1998). In that case the jury convicted the defendant of four criminal counts of violation of the Federal Clean Water Act. The defendant was the founder of a company which blended numerous chemicals into its clients' drums and then requested that the clients return the drums for reuse. Defendant's company cleaned the drums. The drum cleaning generated wastewater, which the defendant personally discharged or ordered his employees to discharge into the city sewer system from a drain located in a company warehouse. Defendant was sentenced

to 1 year in custody, 3 years of supervised release and fined $75,000.The US Court of Appeals affirmed on all counts and defined clearly *the responsible corporate officer doctrine*. Corporate officers can become criminally liable for failure to prevent or correct a criminal violation of a subordinate over whom the officer has responsibility or authority. Existence of the authority is sufficient, whether or not the officer actually exercises that authority in fact. Defendant's knowledge of the criminal activity is necessary for conviction. His personal action, such as personally causing the discharge, is not.

The US Supreme Court denied *certiorari* review of a US Court of Appeals holding that the project manager for the White Pass & Yukon Railroad in Alaska was guilty of violation of the Clean Water Act, where he had direct supervisory authority for all details of track construction. A subcontractor backhoe operator ruptured an unprotected heating oil pipeline, which then discharged oil into the adjacent Skagway River. The manager was found criminally liable for his negligent conduct in failing to properly protect that pipeline. He was sentenced to 6 months in jail, 6 months in a halfway house and 6 months of supervised release, as well as a $5000 fine. The US Supreme Court did not find application of the public welfare statute holding him strictly liable to be a violation of his due process rights. (*Hanousek v. US,* 120 S.C.t. 860, 145 L.Ed. 2d 710 (2000), aff'g *US v. Hanousek*, 176 F.3d 1116 (1999)).

The same type of responsible corporate officer liability theory justifies criminal responsibility of a larger/parent corporation for its subsidiaries. In many cases in the shipping industry, for example with Chevron Shipping Company, a separate corporation exists for the purpose of transporting the oil produced by the larger, umbrella corporation. If the parent company actively participates in and exercises direct control over the activities of the subsidiary's business, then the court may find the parent liable, going up the chain to the largest company, for the actions of the smaller business. The theory of liability supporting such action is termed "piercing the corporate veil". In the *Morris J. Berman* spill of 1994, (*United States v. Bunker Group*), the US District Court for the District of Puerto Rico attached $19.7 million in assets of the parent company to secure a $75 million judgment against three of its subsidiaries involved in a 798,000 gallon spill off the coast of San Juan, Puerto Rico in January, 1994. This legal concept of piercing the corporate veil was used in *Exxon Valdez* to reach the ultimately high civil and criminal damages and fines leveled against the parent: $125 million in fines and restitution, $900 million in civil penalties, $5 billion in punitive damages. Charles De Monaco, the Department of Justice lead prosecutor in *Exxon Valdez* and in the *Berman* case explains how a parent may become liable criminally and civilly for actions of its subsidiary company. "The theory that we relied on in *Exxon* was that if a subsidiary engages in a crime while acting as an agent of a parent company, then the parent should have vicarious liability. We weren't trying to stretch corporate law because the case involved the environment; we were trying to define corporate law as being an extension of traditional agency law" (The Environmental Law Institute, 1999).

This is new law in the area of shipping and how far the Courts may go to impose corporate liability on the parent company for acts of the subsidiary is as yet undetermined. In a recent case involving a Superfund action under CERCLA (*US v. Bestfoods*, 118 S.Ct. 1876, 141 L.Ed. 2d 43 (No. 97-474, 8 June 1998), while upholding the common law doctrine of liability of a parent for acts of its subsidiaries, the highest court in the US, the Supreme Court, limited the parent corporation's liability where there was no showing that the parent company directed the workings of, managed or conducted the affairs of the facility involved. Whether the same type of showing will be required for an oil pollution case, i.e., that the parent shipping company actually managed the operation and control of the subsidiary's tanker causing the spill or release, remains an open question (Environmental Law Institute, 1999; Wagner, 1998).

Even if the US courts choose to limit responsibility to actual acts of control in shipping cases, the adoption and implementation of the International Safety Management Code (ISM Code). (For more information on ISM Code, see Section 3.5 of this book.) The ISM Code provisions may further complicate the issue of how the action of an employee, whether a crew member or master, may subject the ship owner/operator to criminal liability. Increasingly, the ship owner/operator, up to the highest individual in the company, has an obligation to know if and how safety management systems are operating on each vessel of a fleet, to review internal audits and to insist upon correction and compliance with all safety statutes and regulations. The ability of a ship owner/operator to claim lack of actual control over a ship involved in a "human error" or a systems management related incident is lessening. Prosecutors may well use these affirmative requirements of corporate officials involved in shoreside management to prove the necessary element of authority and responsibility and thereby create a case for criminal liability, where actual knowledge of an environmental violation exists (Dickman, 1997, citing language used to convict corporate officers with responsibility and authority to prevent and correct a violation in *US v. Park*, 421 US 658, 673-674 (1975)).

Should the corporate officer or parent company escape criminal responsibility under a more limited application of the responsible corporate officer doctrine, i.e., no finding of authority or direction by the parent of the subsidiary, yet another legal theory may lead to imposition of civil sanctions. The public, in the form of stockholders of companies, demands risk management and protection of corporate assets against losses imposed for avoidable incidents. In a 1996 Delaware Chancery Court ruling, the court held directors personally liable to the stockholders who brought an action against them. The case resulted in a $200 million fine being levied against the parent company, a health care provider, for kickbacks received by physicians and testing laboratories of two of its subsidiaries. The importance of this decision is to put directors, high company officials on notice, that their failure to implement corporate compliance programs which could catch such malfeasance, may subject them to serious liability at the hands of their stockholders. The court *In Re Caremark*

International, Inc. Derivative Litigation, Del. Ch. 698 A. 2d 959 (1996) held that directors can be personally liable if they fail "... to attempt in good faith to assure that a corporate information and reporting system, which the board concludes is adequate, exists, and that failure to do so under some circumstances may, in theory at least, render a director liable for losses caused by non-compliance with applicable legal standards". Again, given the ISM Code requirements, the company officials, including boards of directors, are in an increasingly sensitive position of responsibility to their shareholders (Russo, 2000; Solow, 1998; The Environmental Law Institute, 1999).

One US litigator, Charles De Monaco, summarizes the position that these legal theories place corporate officers and directors in, leaving them on the "horns of a dilemma": "It really becomes a policy decision by each and every organization. Either you run the risk of parental liability by tight control, versus you run the risk of subsidiaries possibly running afoul of the law, hurting the profits of the parent and exposing its directors to liability through a derivative action". (The Environmental Law Institute, 1999). There are no easy answers for the shipping industry in the area of environmental crimes. One corporate defense counsel suggests that "nonetheless, whatever the cause, potential criminal prosecution stemming from an oil spill or a near miss remains a very grave and real prospect to those engaged in the maritime industry" (Wagner, 1998). This assertion is not consistent with the review of actual cases in marine circumstances. The percentage of spills resulting in criminal prosecution is small, only three, including *Exxon Valdez* (Solow, personal communication, 1999). Regardless of the accuracy of industry perception, what is important is that the existence of criminal sanctions against corporate officers at the highest levels of both the parent and subsidiary companies should cause the shipping industry to focus on environmental behavior for each vessel in the fleet and should heighten the importance of compliance with environmental laws in the US and internationally.

4.3.8. Environmental Crimes—The Future

Environmental crimes may frame the new battleground between the shipping industry and its host of regulators, both domestic and international, in the early decades of the new millennium. The shipping community is in an "uproar" over the US application of criminality for violation of marine protective laws. It is too soon to determine whether the ultimate impact of aggressive enforcement of environmental protection on US flag and foreign flag vessels trading in US waters will end in "disaster" or in its intended result, deterrence of poor operators who will be punished for violations, eventually driven out of the business, or potentially reformed so that their behavior conforms with environmental laws and with the conduct of good operators. Those in the business of enforcement liken industry reaction over environmental criminal enforcement to previous overreaction by shippers:

- The forecasted "train wreck" concerning the US Certificate of Financial Responsibility requirement of OPA 90;

- The unsuccessful attack on the validity of the US natural resource damage assessment rule; and
- The prognosticated fallout from implementation of the ISM Code.

Those transporting oil to the US assert that this further development in application of OPA 90 may be the death knell for trading by the responsible shipper in US waters. They contend that good operators will not be willing "to bet their ship, nor their company" by continuing to conduct business under threat of fines and imprisonment.

There are substantial differences in how entities on opposite sides view the purpose, intent and impact of environmental crimes. Lois Schiffer, (former Assistant Attorney General of the US Department of Justice, Environment and Natural Resource Division) addressed an audience of her peers, attorneys and ship owners/operators in September 1997 and explained the "why" behind her department's "vigorous" enforcement of sanctions for conduct breaking the law. According to the Assistant Attorney General, the American people insist upon strong enforcement. The public does not believe that the laws go far enough, or that they are benefiting from the right balance between enforcement and compliance. Environmental crimes are real crimes with measurable impact, in which pollution has caused long-term and permanent damage in which, natural resources are damaged, species are impacted and habitat and wetlands are destroyed.

Many of the international and domestic statutes rely upon voluntary enforcement by people in authoritative positions, such as the captains of industry. The body of environmental statutes containing criminal provisions depends upon the exercise of the enforcement power by the regulatory authorities charged with protecting the public's interests. The possibility of criminal enforcement enhances compliance. No longer can the Chief Executive Officer (CEO) of a company pass the cost of his company's violations onto the consumer, when the CEO might be personally liable for jail time. A shift in attitude is needed amongst many of the players in industry. Such a change in view means a respect for the law. The way to command respect is to mete out just punishment, enforce regulation to achieve adequate deterrence, remedy harm created by violation of law, and level the playing field amongst all competitors. Those who chose to cut corners and violate safety provisions should not gain a competitive advantage over law abiding businesses (Schiffer, 1997).

The attorneys at the Department of Justice (DOJ), Environmental Crimes Section, take their mandate seriously. They are "career prosecutors". Steven P. Solow, former Chief of this section since 1997, not only echoes Lois Schiffer's comments, but he carries them a step farther. Environmental enforcement in the US has been a "remarkably successful endeavor". The proof exists in the considerably improved water quality in the nation's waters since the passage of the Clean Water Act in 1972. Before the Clean Water Act, only one-third of the waters of the US were "fishable" and "swimable". Now, two-thirds occupy that position. Losses in wetlands, averaging almost a half million acres per year, have been reduced by four-fifths of that number. Solow believes

that policies applied to land will work equally well when applied to sea. He welcomes the maritime industry into the enforcement regime that has been in effect for the land-based sector for over 20 years. The future of environmental enforcement is strong. There is a political consensus in the US that the statutes are critical for environmental protection, that criminal prosecution is a necessary component of that protection, and that the burden is on industry to show why the criminal model should be abandoned in the future. Steven Solow feels that he has an obligation to his children to leave them an environment that is just as good as it is today, if not better. The principles of DOJ are shared internationally. Mr. Solow notes that other countries look to the US for training and assistance in the development of their own prosecutorial departments for violations of maritime national and treaty provisions (Solow, personal interview, 1998).

The success of DOJ's program and that of all environmental compliance depends upon a balancing of deterrence and self-policing by those subject to liability. "Those who make serious and responsible efforts to comply with the law and who discover, disclose and correct misconduct promptly should not be discouraged from those practices". DOJ encourages companies to conduct internal audits, catch and correct problems before incidents occur, and make the necessary disclosures to the appropriate regulatory authority. To guide prosecutors in their exercise of discretion in environmental criminal cases, keeping the balance of deterrence and self-initiative in mind, and to assist the regulated community with a sense of the process, DOJ developed a memorandum in 1991 titled "Factors in Decisions on Criminal Prosecutions for Environmental Violations in the Context of Significant Voluntary Compliance or Disclosure Efforts by the Violator". The memo contains guidelines by which prosecutors can decide if a particular case commands leniency for prosecution of a violation, or not. Factors considered by DOJ are:

- Voluntary disclosure by the perpetrator;
- Cooperation to make all relevant information available during an investigation;
- Preventive measures and compliance programs;
- Pervasiveness of non-compliance;
- The existence or not of an internal disciplinary program; and
- Subsequent Compliance efforts (Solow, 1998; personal interview, 1998).

Individuals who are corporate officials or CEOs are warned that in vessel cases, DOJ intends to identify the highest corporate officer responsible and then assert criminal action against those who have actual knowledge of the actions or behavior leading to violation of an environmental law, have the authority over those acting on their behalf, such as company employees, and have the most to gain from conducting business. Those vessel fleets taking short cuts and subverting legitimate safety measures will no longer be free to benefit from unfair competitive advantage. The risk of such an attitude is high. DOJ will seek imprisonment of top level officials (Linsin, personal interview, 1998).

Capt. Malcolm Williams, former Chief of the Office of Maritime and International Law, takes a slightly more moderate position than that of DOJ. He believes strongly that OPA 90, including its criminal enforcement provisions, is working. There is less oil going into the oceans. The gallons spilled per million gallons shipped in US waters since the passage of OPA 90 have reduced drastically, from 14 to 5 per million. The risk factor is increasing for the irresponsible carriers. The "bad guys" are being weeded out of the business of shipping, as enforcement of regulation improves and the responsible operators on their own initiative police their organizations. Yet, Capt. Williams does see the bind that some of the enforcement issues create for industry. He lobbies for a balanced approach, one which accomplishes cooperation in the self-audit process to prevent the spill in the first instance, and then, if oil spills, to provide the authorities, like the US Coast Guard with the necessary information to respond to the spill quickly and efficiently. While anyone from crew on the vessel on up the chain can be arrested, they are required to disclose the spill by law. Individuals may be less inclined to share information during a spill response if that person (or persons) is concerned about potential criminal liability. In the international arena, Capt. Williams reports hearing higher company officials state their concern about even coming to the US during a spill event in which their company is involved, for fear of "being arrested in their hotel lobby". While acknowledging that these fears exist, Capt. Williams believes them to be exaggerated, given the types of criminal cases actually brought in the US (Williams, personal interview, 1998, personal communication, 1999).

Those in industry or acting as counsel for ship owners/operators hold very strong opinions about the reasons for and the impact of criminal enforcement in the maritime arena. Their views vary widely, but they contain common themes. At one extreme are those who see the motive behind DOJ prosecutions as being based more on politics and economics, than legal reasons (Wagner, 1998). Others emphasize the gain not only to federal governmental coffers, but also to states from multimillion dollar fines imposed under the auspices of public welfare statutes: "In the current era of budget tightening, prospective million-dollar cash infusions to government treasuries or environmental/conservation funds are sure to arouse grass-roots sentiments. In the future, 'Salem polluter hunts' may not be beyond the realm of possibilities, although some might say that in comparison, the witches actually had it easy" (Starr, 1997).

For those who have been on both sides of the fence, as prosecuting attorneys and now as defense attorneys for ship owners and operators, there is a real concern that the maritime industry is at the top of the target list for prosecutors who have a strong "criminal arsenal". They urge sparing use of these tools. "It is therefore incumbent on the Department of Justice to prosecute criminally only those cases that truly merit criminal prosecution, and not those that are truly accidents, and not be impelled to prosecute simply because of political, public, or media pressure". There is great distrust by industry of the government and its motives, and fear that, even if a company does its best, it will still be prosecuted in the event of an incident. If the company does

not cooperate as fully as DOJ may wish during an incident, because of real concerns about criminal prosecution, the careful exercise of caution may well be treated as obstruction of justice. In other words, paranoia is very high amongst the shipping community (Barrett, 1999).

DOJ asserts that it makes sparing use of the tool of criminal prosecution. Of the forty or so criminal vessel pollution cases brought in about 8 years, Solow knows of no case prosecuted for any reason, except that it merited criminal prosecution under the law (Solow, personal communication, 1999).

There is some basis in fact to industry's perception, due to certain judicial realities. The criminal route is faster and easier than the civil action remedy. Increasingly, regulators charge corporations and not just the individuals. There are good, policy reasons behind this expanded scope: to bring the company into compliance with an adequate safety management system, to then have a court monitor that compliance and to place the company on probation to ensure effective implementation (Environmental Institute, 1999). Under environmental compliance programs, companies like Royal Caribbean Cruise Lines, may in fact reform their practices and become models for their industry (Solow, personal communication, 1999).

These differing outlooks have shaped the areas of contention, which will be the center of industry attention for the next years. The primary concerns voiced by industry about the application of criminal laws center around these issues:

- **Migratory Bird Act/Refuse Act:** According to the shipping community, these acts are being used for purposes never intended by Congress. Strict liability provisions of the acts carry severe criminal penalties. Under these "no fault" statutes, in the absence of criminal intent, the fact alone that oil is spilled into the water may penalize even the good operator who has done all that he can and still is held liable. Admiral Kime, retired Commandant of the US Coast Guard, states, you can run a ship into a bridge, knock a school bus full of children into the water, and not be strictly liable for injury to them. In contrast, under these older acts, you can take the same situation, substitute a flock of geese damaged for children, and the operator will be held strictly liable (McCormack, personal interview, 1999; Kime, personal interview, 1999). A Washington, DC-based coalition of industry organizations is seeking to amend the scheme of criminal sanctions for environmental incidents so that only OPA 90 criminal provisions apply to such incidents, eliminating application of other statutes such as the Migratory Bird Act/Refuse Act strict liability statutes (Hobbie and Garger, 2001).
- **Limited Immunity from Prosecution:** During a spill incident, there is a chilling effect from the possibility of criminal prosecution upon all persons who would otherwise be involved in a coordinated response, from the crew member to the highest ranking shore-based official. Industry is seeking a form of limited immunity so that the response can take place efficiently and effectively, rather than on a less than cooperative basis. Industry voices a concern about an unpalatable

balancing that must be conducted in an incident. That they are "like sitting ducks, forced to comply and to cooperate", but that in doing so, what they say or do will be used against them in a later investigation. Instead of reaching for the boom, those involved call their lawyers. Crew members may be set off against ship's masters and their company, in a classic conflict of interest situation. Each individual may need separate counsel. This is not a good environment in which to focus on the task at hand, cleaning up the oil (Barrett, personal interview, 1998; personal interview, 1998; Kime, personal interview, 1999).

- **Immunity from Audit Disclosures:** A major issue is the question of how the results of internal audits, such as those conducted for ISM Code compliance or in the usual course of business as a routine part of a company's environmental safety management system, may be used or misused during voluntary disclosure or subsequent criminal investigation if an incident occurs. The concern is that access to internal disclosures will be misused in arenas different from the spill context, such as personal injury actions in "slip and fall cases" under the Jones Act (Section 27 of the Merchant Marine Act of 1920). Further, industry contends that it is unfair to use a document produced as the result of an internal audit for the purpose of improving a criminal action against the company. This fear of disclosure could have a chilling effect upon the purpose of the ISM Code, which is self-regulation and corrective activity due to effective disclosure within a company. Reports may be "whitewashed". The suggested solution is a limited immunity, which would not allow for use of the particular document or fact disclosed based on an internal audit in a criminal prosecution (Cox, personal interview, 1999; Kime, personal interview, 1999).

  Steven Solow of DOJ responds on the subject of limited immunity, calling the whole issue a "solution in search of a problem". The current public policy, including criminal enforcement, forces industry to self-regulate, to conduct audits and correct problems before they develop into oil spills or serious accidents. Self-reporting works only if there is credible enforcement to encourage compliance. Knowledge gives rise to a duty and obligation to remedy the problem. Self-reporting is good business. Shrouding activity in a cloak of secrecy is not the intention of environmental acts. Solow knows of no cases in which his department has taken action against a company who performed an audit and used that as a road map to prosecute someone criminally, absent other information that would lead DOJ to conduct a criminal investigation or an actual incident. In other words, DOJ has not sought an audit, and then used the findings as a basis for conducting a criminal investigation (Solow, personal interview, 1998, personal communication, 1999).
- **Misuse of the Unseaworthiness Statute:** In the *Berman* spill, a case with a long litigated history (*US v. Rivera*, 942 F. Supp. 732 (D.P.R. 1996), *aff'd* No. 96-2188, Slip Op (1st Cir. 1 May 1997), *vacated, reh'g en banc granted*, (1st Cir. 29 May 1997), rev'd 131 F. 3d 222 (1st Cir. 1997) (*en banc*), one of the grounds upon

which the Puerto Rican federal District Court found Pedro Rivera, the general manager, guilty for a major spill off the coast of San Juan, Puerto Rico, was his sending a ship out to sea in an unseaworthy condition *with knowledge that it would likely endanger the life of an individual* (Emphasis added). While the Court of Appeals reversed Rivera's conviction, it did so not based upon a disagreement with the legal theory, but rather upon the finding that the facts did not support the contention that Rivera knew the ship's condition would endanger life. The Maritime Law Association filed an *amicus curiae* brief on this issue because of the strong concern that this case might create a new cause of action, titled "criminal unseaworthiness" in the absence of requiring as a precondition the traditional findings of unseaworthiness under the long-established statutory scheme. In essence, the Maritime Law Association supported the position taken by the dissenting Judge in the First Circuit panel that the majority's holding "posses a substantial threat of converting untold numbers of unsuspecting persons into prospective felons" (Wagner, 1998; McCormack, personal interview, 1999).

Further, the MLA understood that the 1983 recodification of Title 46 was not meant to create or expand criminal law, but rather was a recodification of existing law. By creating a new maritime crime of unseaworthiness, a result has occurred not intended by either the US Coast Guard nor by Congress (MLA, 1997).

- **Misuse of the False Statements Act and Chilling Impact on International Law:** In a recent decision involving the Royal Caribbean Cruise Line, the US Coast Guard in Miami, Florida used false statements (an omission of a discharge) made in the company ship's Oil Record Book, as required by MARPOL 73/78 (see discussion, Section 4.2.1 of this book). When the ship entered the US port, based upon a violation observed by US Coast Guard aircraft, the US Coast Guard boarded the ship to investigate, reviewed the record book, and then referred the violation to the Department of Justice (DOJ) for indictment of the foreign flag ship. The ship had discharged oily bilge water that had not passed through the oil water separator, into Bahamian waters, outside the US 200 nautical mile exclusive economic zone. The DOJ position was that a Port State has full control over vessels entering its ports, and can, under concurrent jurisdiction provided by MARPOL 73/78, prosecute a ship and company for lies contained in its record book. The US District Court for the Southern District of Florida denied the motion by Royal Caribbean Cruises, Ltd. to dismiss the action, holding that the exercise of Port State control did not have a chilling impact on the international system. The court relied on the testimony of Capt. Thomas Gilmour, of the US Coast Guard that, "(a)ny holding that would undermine the ability of port states to ensure accuracy and truthfulness in these certificates and records would adversely affect the goal of the IMO, the Congress, and the Coast Guard to eliminate substandard ships and operations". The company settled the case after this denial (*US v. Royal Caribbean Cruises, Ltd.,* Case No. 98-0103-CR-Middlebrooks, Order on Motion to Dismiss, p. 14 (US Dist. Ct., S. D. Fla., 1998)).

Industry's belief is that the action of the US Coast Guard is akin to "hostage taking", and that under international law, the Port State should defer to the Flag State administration for proper enforcement of treaty violation in waters far outside US jurisdiction (Carr, 1998).

- **Negation of Financial Guarantee:** Richard Hobbie, President of the Water Quality Insurance Syndicate, points out that the aggressive stance of DOJ in prosecuting responsible parties for environmental crimes may have an unintended consequence. A finding of "willful misconduct", which would occur in the course of a criminal prosecution, may negate the financial guarantee of the American or P&I insurer. In the *Morris J. Berman* spill, Mr. Hobbie's syndicate is availing itself of the willful misconduct defense under OPA 90 to seek reimbursement of $10 million of clean-up costs paid by WQIS from the Oil Spill Liability Trust Fund (Hobbie, personal interview, 1999).
- **Impact on Oil Spill Response:** The misuse of criminal prosecution may have a chilling effect upon oil spill response. The threat of criminal prosecution alone, has caused and may continue to cause individuals subject to criminal sanctions to assert their Fifth Amendment rights, as allegedly did the Master in the *New Carissa* spill in February 1999 off the coast of Oregon. The net effect on readiness and prevention may be that the NTSB and the US Coast Guard will lose valuable information about, for example, causation, from the actual incident, which prevents understanding and establishment of future prevention programs based on "lessons learned". Unlike civil agency actions, where information learned cannot be used for discovery or revocation proceedings, there is no such statutory prohibition for criminal actions. OPA 90, with its imposition of an obligation to cooperate and lack of immunity for information disclosed in subsequent criminal prosecution, places a Responsible Party in an untenable situation. Industry advocates describe this as leaving the Responsible Party to choose between two impossible outcomes, "... risking a literal 'confession', and refusing to cooperate, which brings with it the prospect of waiving the limitation on its liability found in OPA 90" (MLA, 1999). Finally, industry contends that the uninformed use of criminal laws will have a cooling impact on the otherwise successful partnering programs with the US Coast Guard (McCormack, personal interview, 1999).

In spite of these areas of dispute, environmental criminal prosecution is having its intended effect upon the oil shipping business, i.e., motivating ship owners and operators to police themselves, to determine non-compliance, to take corrective action, and to avoid oil spills. Over and again, attorneys for ship owners urge responsible action on the part of the industry, to prevent the uncomfortable position of becoming a criminal violator. The principles they recommend that businesses adopt mirror those stated in the ISM Code:



The 639-foot double-hulled Panamanian-registered wood chip carrier *New Carissa* ran aground 4 February 1999 while waiting for high tide to enter the port near the mouth of Coos Bay Oregon on its way into the bay to pick up a cargo of wood chips and breached its number four and five fuel oil tanks, as well as the number one diesel tank spilling an estimated 70,000 gallons. The grounding occurred in high winds with ocean swells of 15–17 feet and heavy surf making response extremely difficult. The grounded vessel containing 359,000 gallons of fuel oil and 37,400 gallons of diesel fuel in its tanks posed a coastal environmental threat. The ship was subsequently set afire three times, blown up, broken in half, towed to sea, lost at sea and on 3 March 1999 subsequently washed ashore again at a town north of Coos Bay, called Waldport and was finally towed to sea and sank on 11 March 1999.

- Responsibility for environmental law compliance is an individual and corporate obligation. Ignorance of the law is not a defense;
- Companies should adopt a safety culture, conduct regular audits, catch non-compliance, correct detected deficiencies, and keep good records of these audit actions;
- Training of employees from the mate to the master is the best way to ensure environmental compliance;
- Outside consultants can help the organization's officers and employees to gain the knowledge and understanding needed to institute a safety management system; and
- In the event of a spill, companies should promptly report to the appropriate authority and then cooperate fully, if necessary through legal counsel, with responders and investigators, without lies or omissions (Sullivan, 1999, Barrett, 1999; White, 1999).

While most organizations point to the US as the primary enforcer of environmental crimes, increasingly other countries are passing or enforcing national criminal legislation to force polluters to pay and to impress upon companies the urgency of effective preventive action in the first instance. Ireland is ratifying the International Convention on Oil Pollution Preparedness, Response and Cooperation Convention, 1990 (OPRC) and using their national implementing legislation to impose penalties of up to US $13.1 million for non-compliance for oil spills within 200 nautical miles of the coastline. This is an example of yet one more country taking action to enforce protection of its waters (OSIR, 1999b). The most "startling" action may be that of the United Arab Emirates, considering imposition of a "death penalty" for "willful" pollution. While it appears that the proposed law will apply the death penalty only to deliberate pollution from nuclear materials, such an extension of a nation's criminal enforcement powers should give industry much cause for concern. As countries face increasing pollution of their "national wealth", enforcement may become stricter and more severe (OSIR, 1999c).

While potential death penalties raise the stakes considerably, their imposition is not in the realm of immediate concern like the listed "hot topics" raised by industry about implementation of various US statutes and the impacts of enforcement upon response. When the "dust settles" and the inconsistent and often contrary viewpoints of those involved are resolved, harmonized, or at least tempered, the regulators, ship owners/operators, responders, and lawyers for each would do well to consider the truth of the matter. As Richard Hobbie so aptly phrases it, "I am not your enemy and you are not mine. The oil is our enemy" (Hobbie, personal interview, 1999).

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Chapter 5

Regulatory Model—Australia

Many countries have put into place sophisticated oil spill planning and response systems, which cover all aspects affecting the transportation of oil through their territorial waters, including response to oil spills. They have effective maritime administrations and national legislation that implements international treaties. Australia's management of the Great Barrier Reef (GBR) is one of the leading models of effective protection of a world-class coral reef resource from oil pollution incidents.

The GBR stretches more than 2000 km along Australia's eastern (Queensland) coast, covers approximately 345,000 km^2, and contains 2900 individual reefs and 300 reef islands (or cays) (Craik, 1995). The length of the coastline of the mainland and the larger islands is estimated to be some 70,000 km, with islands numbering about 12,000 in total (Nelson, 2000). The GBR supports the greatest diversity of plant and animal life found anywhere in the world: 1500 species of fish, more than 350 species of hard coral, over 4000 species of mollusc, and at least 242 species of birds. The GBR is the world's largest coral system, 93% of which falls under the Great Barrier Reef Marine Park, controlled by the Great Barrier Reef Marine Park Authority (GBRMPA) (Craik, 1995).

Tourism in the reef and coastal areas represents an A$700 million a year industry. Commercial and recreational fishing pulls in another A$400 million annually (Craik, 1995). Australia first recognized the need to protect the GBR in the early 1970s, when certain mining and oil interests announced their intent to mine the reef and drill for oil and minerals. Public reaction led to establishing the Great Barrier Reef Marine Park under the Great Barrier Marine Park Act, 1975. Oil drilling and production were subsequently banned in the GBR region and, by later amendment, control of the GBRMP was placed in the GBRMPA.

Australia is the fifth largest shipping task in the world in terms of tonnes of cargo shipped and kilometers traveled, and depends almost exclusively on shipping to move its imports and exports. About 12,000 ships visit Australia each year (Craik, 1995). Three thousand ships navigate the inner route of GBR annually, the majority of which are tankers, transporting everything from coal, nickel ores and alumina to raw sugar, sand, bauxite and oil. These ships of some 200,000 DWT plus carry significant quantities of bunker fuel (Watkinson, 2000). Only 5% of the ships moving through Australian waters are tankers that carry crude or refined oil products. Tanker traffic is on

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the increase as the Queensland population grows and demands increased refined oil products. Australia's future crude oil needs are expected to be supplied primarily from Indonesia and Australia's Timor Sea Fields (Craik, 1995).

Two routes of passage, known as the "inner" and "outer" routes, wind through the GBR's complex and dangerous maze of reefs, shoals, cays and islands, and connect with the Torres Strait at the region's northern end. The inner route follows the calmer waters between the reef and the Queensland coast. The outer route travels the deeper waters of the Coral Sea, seaward of the GBR, with entry into the lagoon between the reef and the coast at specified and limited narrow passages.

Eighty percent of all vessel voyages occur in the inner route, where other hazards include the 1500 fishing vessels and 100,000 recreational and tourist vessels that congest shipping lanes in and around the ports. Whales and other large marine animals compound traffic problems (Ottesen, 1994b). Given the natural dangers of navigation, the high volume of shipping traffic and the constrained routes, the risk of an oil spill in the GBR in the next 20 years is considered high (Craik, 1995). A recent risk analysis report predicts that the amount of oil which might be spilled would be relatively small: a spill of 10,000 tonnes or more may occur only once every century. Smaller to middle size spills are more likely in key areas of high risk, such as the Eastern coast of Queensland, major ports around Sydney and Melbourne, and certain areas of Western Australia. For these areas, predicted spills of 100 tonnes or more may happen once every 17 months, of 1000 tonnes or more, once every 7 years, and of 10 tonnes or more, every 8 months (Nelson, 2000).

Even if the prediction of low spillage of oil holds true, the incidence of serious "near misses" and groundings with the GBR means that continued assessment of risk needs is required for the GBR (Watkinson, 2000).

Australia combines national and international legislative muscle with national, state and territorial response and zoning plans to protect this major resource. The entire GBR Marine Park is a marine protected area, zoned for multi-use with zones of no activity, restricted activity such as research, and limited commercial activity. Prohibited activities include oil drilling and production, mining, littering, spearfishing, and extracting large specimens of certain fish species. High impact activities require permits from the GBRMPA, which can be granted only after an extensive assessment is conducted.

Because of the size of the GBR, enforcement is a major problem. The reef is so huge that catching violators is almost impossible. Even when violators are caught by the Australian authorities, conviction is uncertain. For example, regulations prohibit fishing within 1500 m of the reef flat, but determining where the 1500-m line lies is often at question (Steven, personal interview, 1996). Size impacts response to an oil pollution incident. Distance of reefs from shore, inhospitable weather during much of the year, remote areas far from adjacent populations are factors which create great difficulty for effective response. They limit the ability to use more traditional response such as booming, on sea mechanical recovery, and mechanical shoreline clean-

up, particularly in large spills (Craik, 1991). Communication between responders, movement of personnel and equipment, and logistical support can become substantial problems during a response due to the "tyranny of distance" imposed by the vast size of coastline and maritime waters. Infrastructure existing at ports may not be readily available outside the most densely populated capital city ports (Lipscombe, 2000).

While Australia can protect its own seas to a degree, the driving force behind control and protection of its GBR comes from Australia's ratification of the major international conventions, specific and specialized international status accorded to the GBR, and adoption by Australia of necessary implementing legislation. Australia has embraced the international system to ensure that its seas, territorial waters, and ports remain safe from pollution. Australia is a signatory to and implemented its own national legislation as follows:

- MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978) given effect in Australia by the Protection of the Sea (Prevention from Ships) Act 1983 and the Navigation (Protection of the Sea) Amendment Act 1983. Under MARPOL 73/78 provisions, a Port State can protect its waters by inspection of ships entering its ports for compliance with treaty requirements. (See discussion, Section 4.1.5.) The Australian Maritime Safety Authority (AMSA) maintains a strong Port State Control program. In 1998, 2946 ships were inspected. 88.5% were in compliance with MARPOL 73/78 (AMSA, 1997/1998).
- CLC (International Convention on Civil Liability for Oil Pollution Damage, 1992), given effect in October 1996 in Australia by amendments to the Protection of the Sea (Civil Liability) Act 1981.
- FUND Convention (International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1992), given effect in Australia in October 1996 by the Protection of the Sea (Oil Pollution Compensation Fund) Act 1993 and other enabling legislation.
- INTERVENTION (International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties 1969 and amending 1973 Protocol), given effect in Australia by the Protection of the Sea (Powers of Intervention) Act 1981. In cases of "grave and imminent danger", authority exists to remove cargo, salvage the vessel, sink or destroy the ship or its cargo, and take control of foreign flag ships regardless of the location of the vessel.
- OPRC (International Convention on Oil Pollution Preparedness, Response and Co-Operation, 1990), upgrades response capability of ships for oil spills, provides for emergency plans, reporting requirements, training and safety standards. OPRC entered into force in Australia in July 1992 under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Section 11A). Australia has regional agreements in place with New Zealand, Indonesia, Papua New Guinea, and New Caledonia (AMSA, 1998).

As the coastal state, Australia can adopt national laws relating to navigational safety, marine traffic control, preservation of the environment, and control and prevention of pollution from oil spills and other substances. Shipping lanes and shipping schemes can be prescribed, particularly where inherently dangerous or noxious substances are being shipped.

In November 1990, the GBR was declared the first Particularly Sensitive Sea Area (PSSA) by the International Maritime Organization (IMO). PSSAs are defined as areas "which need special protection through action by the IMO because of their significance for recognized ecological or socio-economic or scientific reasons and which may be vulnerable to damage by maritime activities" (Craik, 1995).

The PSSA declaration places special protective measures on all shipping activities taking place in the GBR. Since October 1991, all loaded oil tankers, chemical tankers, liquefied gas carriers, and all vessels of 70 m or more in length must carry a licensed pilot when taking passage through the inner route of the GBR between Cape York and Cairns, or when passing through the Hydrographers Passage, a much-used narrow passage between the inner and outer route. An amendment to the Great Barrier Reef Marine Park Act 1975 implemented the compulsory pilotage section (Ottesen, 1994a).

The Australian Maritime Safety Act established the Australian Maritime Safety Authority (AMSA) in January 1991. This agency is charged with augmenting "the delivery of safety and other services to the Australian maritime industry". AMSA assumed five basic functions to:

- Enhance maritime safety;
- Provide a national system of navigational services;
- Administer marine pollution prevention and response programs;
- Provide services to the maritime industry; and
- Coordinate maritime search and rescue.

AMSA is responsible for administering applicable maritime international treaties, the Navigation Act 1912, and other maritime national legislation such as the Protection of the Sea (Prevention of Pollution from Ships) Act 1983. AMSA is the authority designated to enforce compulsory pilotage, oversee training and respond to oil spills, and to conduct Port State control and tanker surveillance inspections (Australian Department Of Transportation, 1995). AMSA's authority over the exclusive economic zone extends (EEZ) over an area of more than 11 million km^2, making Australia's EEZ one of the largest in the world (Nelson, 2000).

The master and owner of a vessel which navigates through a compulsory pilotage area without a pilot are both liable for felony prosecution and a maximum penalty following conviction of $50,000 for an individual and $200,000 for a corporation. The regulation applies whether the violator enters an Australian port on the same or a later trip, or returns at a later date with the same master. Since its inception, compliance with compulsory pilotage has risen from almost 90% to almost 100%, according to

one study, although another study indicates that 25% of foreign vessels traveling on the inner route fail to meet the pilotage requirement. With the new upgraded pilot licensing system instituted in 1993 and administered by the AMSA, the impact of compulsory pilotage through the GBR is improved safety and lessened possibility of oil spills (Ottesen, 1994b). Effective July 2001, compulsory pilotage applies to increased routes through the GBR, including the outer edge of Hydrographers Passage. Additionally, penalties for oil spill polluters have increased substantially (OSIR, 2001).

The designation of the PSSA allows the governments to take special preventive measures:

- Asserting certain discharge restrictions;
- Adopting routing measures, including prohibiting travel through certain areas;
- Introducing environmental fees, such as tolls for transit;
- Prohibiting certain activities such as offshore mineral exploration and fishing activities;
- Developing site-specific contingency plans to combat oil spills;
- Introducing Flag and Port States strict surveys of ships commensurate with increased risk to the environment due to age of vessels and other safety factors; and
- Instituting vessel traffic management and reporting systems; for example, requiring vessels traveling through the reef to report every 4 hours.

The Australian government has implemented some of these measures. The international community assisted the GBR when, under MARPOL 73/78, they defined the designated area for no ship discharges of any type for the area between the Queensland coastline and nearest land as a line drawn between coordinates on the outer edge of the GBR. This translates to a prohibition against discharge for oil tankers of up to 50 nautical miles from the outer edge of the GBR, and up to 200 nautical miles from the Queensland coast. For vessels other than oil tankers, the range of the prohibition extends between 12 and 162 nautical miles. Without this special definition, the usual distance from actual land in which discharges are prohibited varies from 3 to 12 nautical miles (Ottesen, 1994a, b). "Effectively this means all operational discharges are prohibited within GBR" (Watkinson, 2000).

In October 1973, the Australian government adopted a national strategy for responding to marine oil spills. Australia conducted a major review of the plan in 1992 and finalized its present format in 1998. The plan is called the National Plan to Combat Pollution of the Sea by Oil and Other Noxious and Hazardous Substances (the National Plan), administered by AMSA (AMSA, 1997/1998). The National Plan maintains a national integrated government/industry organizational framework capable of responding effectively to oil pollution incidents, and to manage funding, equipment and training programs to support the plan. AMSA conducts a comprehensive training program to provide training of skills needed by response personnel.

The objectives of the Plan are to provide a national integrated system for responding promptly and effectively to marine oil or chemical pollution incidents by designating competent national and local authorities and establishing:

- "A national contingency plan for preparedness and response which includes the organisational relationship of the various organisations involved, whether public or private;
- An adequate level of pre-positioned spill combating equipment, commensurate with the risk involved, and programs for its use;
- A comprehensive national training program to familiarise personnel at all levels with the requirements of planning and responding to the needs arising from an oil or chemical spill. This program includes conducting frequent exercises;
- Detailed national, state, local and industry plans and communications arrangements for mobilising resources and responding to an oil or chemical pollution incident;
- An awareness by Governments, media and the community of the limitations inherent in a response to a major oil or chemical spill, with particular emphasis on the understanding that: other than in exceptionally favourable conditions, current technology does not exist to prevent weather-driven oil washing ashore. In many cases, the most environmentally-friendly solution may be leave it alone and let nature take its course.
- In many situations chemical spills cannot be contained or recovered, and the primary response activities will be reducing the risk to the public and wildlife and minimising the damage to the environment" (AMSA, 1998a).

Funding for the National Plan, based on the "polluter pays" principle, is from a shipping tax on vessels of "not less than 24 meters in length having at least 10 tonnes of oil on board as fuel or cargo". The 1998 rate was set at 3.3 cents per net registered tonne per quarter with a minimum of $25 per quarter. Two acts authorize the levy: *Protection of the Sea (Shipping Levy) Act 1981* and *Protection of the Sea (Shipping Levy Collection) Act 1981*. Recovery of costs incurred by the government in responding to oil spills is provided by the Protection of the Sea (Civil Liability) Act 1981 (AMSA, 1998b). Currently, the levy produces an annual amount of $3.5 million (Nelson, 2000). The levy is used in part to fund maintenance and administration of the National Plan and stockpiles of industry owned oil spill response equipment. In 1991, the oil industry and the Australian Institute of Petroleum established the Australian Marine Oil Spill Centre in Geelong, where much of the oil spill response equipment is maintained.

The National Plan is supported by state and local contingency plans, such as the TORRESPLAN for the Torres Strait and the REEFPLAN for the GBR. These plans prioritize oil spill response based on threats to human life, followed by habitat threat, then rare and endangered species, and finally threats to other natural resources based on environmental, social and economic factors and the specific spill incident. In 1998,

AMSA received $1 million from the National Heritage Trust to establish a "National Oil Spill Response Atlas", based upon updating the current plan atlas. The outcome of this funding is a compilation of geographical and textual data into standard GIS format for most of Australia's coastal and maritime waters. Additionally, the authority is developing Search and Rescue and Oil Spill Trajectory Models based on meteorological and oceanographic data and trajectory modeling to track oil spills in the GBR. The atlas will link to these models, as well (AMSA 1997/1998; Nelson, 2000). Other technological developments include continued review of a Fixed Wing Aerial Dispersant Capacity contract between AMSA and a provider, for delivery of pre-approved dispersant by air throughout the plan territories (AMSA, 1997/1998).

Historically, the government of Australia and not the ship owner/operator responded to oil spills. This spill response system is changing. Effective 1 January 1999, Australia will adopt an Incident Control System, similar to the Incident Command System used in the US for all spill response, to be put into effect over a 3-year period. Changes in all contingency plans at national, regional, and local levels are underway (AMSA, 1997/1998). The expected implementation date for this plan is year-end 2001 (Nelson, 2000).

International support, national legislation, educational activities on a statewide and territorial basis, compulsory pilotage, national and specialized response plans, and monetary sanctions, all protect the GBR. Australia has been fortunate. Only two major oil incidents have occurred since 1970. During the 1997/1998 fiscal year, AMSA received reports of 251 marine oil spill sightings, 71% of which were within port areas of control. Nine incidents required activation of the National Plan (AMSA, 1998b). Since 1970, there have been only thirteen incidents involving loss of more than 100 tonnes of oil in Australia's waters (Nelson, 2000). Diversion and control of shipping, implemented through special legislation, is part of the answer for protection of Australia's Great Barrier Reef.

The other piece of the solution puzzle is the strong focus upon preparedness and then effective, science-based response. Michael Julian, Executive Manager for International Affairs of AMSA summarizes the strengths of the Australian system: partnership with industry, maintaining a high level of preparedness and response through continual upgrading and readiness of equipment, use of appropriate technology, with dispersant use as a main line of attack, research into other methods of response, such as bioremediation, and strong enforcement of International Maritime Organization conventions, including Port State control, in addition to pilotage and navigational requirements (Julian, personal interview, 1999). Yet even with this most comprehensive system, Australians do not rest easy that everything that can be done to prevent catastrophic oil discharge has been done. A former official at the Great Barrier Reef Marine Park Authority voiced the common sentiment: "We live in fear of an oil spill" (Steven, personal interview, 1996).

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Chapter 6

The Marriage Between Science and Technology

Oil spill response management is quite often impacted by the lack of available real-time and historical data which impacts the ability to make a rapid decision. Rapid decision making and the selection of effective response technologies can significantly minimize the environmental impact and subsequent total costs of oil spill response and clean-up. For use of dispersants and in-situ burning technologies in spill response, decisions needs to be made immediately in order to respond within the first 2–24 hours after a marine oil spill has occurred. Remote sensing data have become an important factor in the decision-making system in order to identify and monitor oil spills and to provide an operational downlink (real time) for night-time operational direction of resources (ships) in clean-up.

6.1. Failures of Present Oil Spill Contingency Planning, Response, Education and Training Strategies

A global review of national arrangements to enhance oil spill capabilities was conducted by the International Tankers Owners' Pollution Federation Fund (ITOPF) and published by the Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO). It reported disparity among nations and regions and states that oil spills from marine sources, particularly tanker accidents, continue to pose a risk to coastal nations and island countries (MEPC, 1995). Actions taken by ITOPF since this report have reduced the number of large tanker spills.

Over time, contingency planning and spill response (clean-up) have been better integrated to strengthen response capabilities. Because we are using knowledge and experience learned from each previous spill to respond to the next one, this trial and error works, except when the oil or the environmental conditions are different. The critical elements that are still currently missing in oil spill contingency planning and best response are:

- An understanding of oil properties;
- Changes in these properties (weathering) over time; and

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- The subsequent influence of these properties on technology effectiveness.

Given the consistent number of oil spills today (1.3 spills per 10^9 barrel transported), and the lack of a scientific basis for spill response decision making, the technology window-of-opportunity concept may provide the best tool for oil spill contingency planning and response available. It is a highly targeted system, in which the selection of response technologies will be more efficient, cost effective, technically correct, and environmentally sensitive and appropriate. In addition, the windows concept by being scientifically based may provide decision makers with greater legal protection in the selection of the best response.

6.2. The Need for a Scientifically-Based Decision-Making Tool

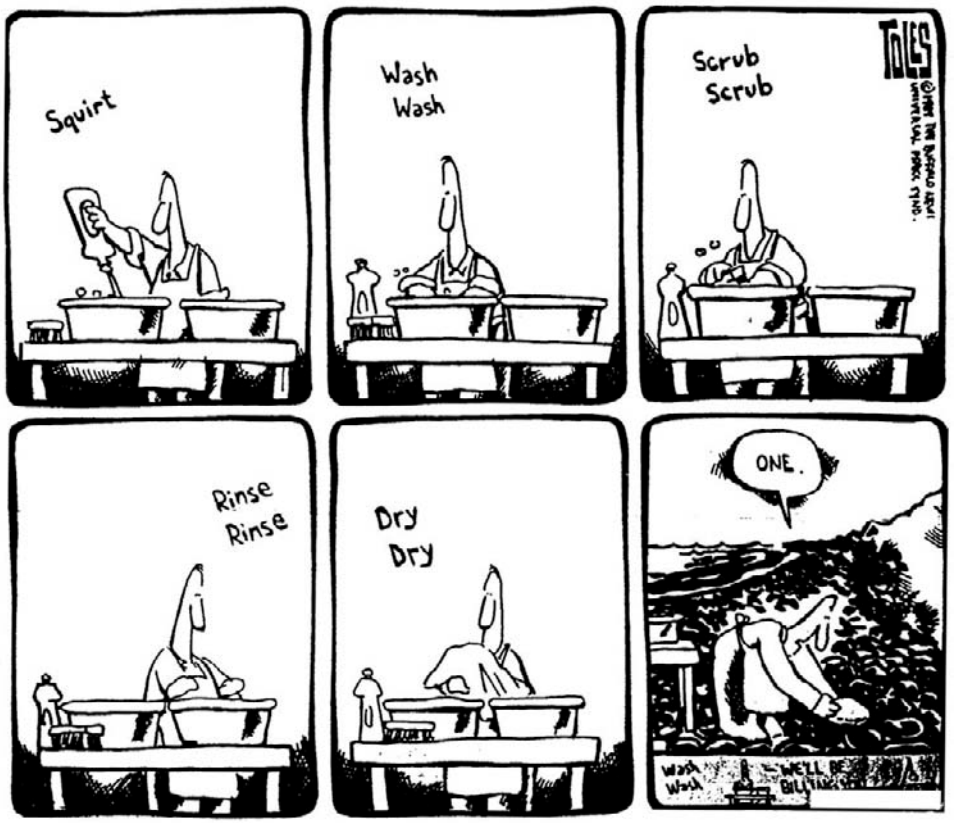
There is a need for a scientifically-based decision-making tool to assist in the decision-making system in oil spill contingency planning and response. The technology windows-of-opportunity concept, by utilizing the combined (projected weathering under specific environmental conditions) determined from dynamic oil weathering model with performance technology data, are a unique planning and decision-making tool in oil spill response because it identifies and defines the windows of effectiveness of different response methods and technologies (equipment) for specific oils under given environmental conditions and weathering of the oil following the spill. In addition, the integration of spill trajectory and environmental assessment with the windows concept provides a significant improvement in oil spill response and clean-up capabilities.

The technology *Windows-of-Opportunity Oil Spill Concept* is an oil spill response decision-making tool with a scientific and engineering basis. It integrates a wide range of real-time and historical data and information to achieve *Best Response*. The purpose of "Windows" is to provide policy and decision makers with recommendations for "how and when" response methods and technologies (i.e., dispersants, bioremediation in-situ burning, and mechanical recovery technologies) should be used in marine coastal waters.

Response management (local, state, federal agencies, response planners, clean-up organizations (responders), insurance companies, tanker owners, and transporters) using this tool will minimize the economic, environmental and social impacts from oil spills, and conduct clean-up operations in a most cost effective and efficient manner.

As technology evolved from mechanical clean-up (booms and skimmers) to treatment with dispersants, emulsion breakers, adsorbents and in-situ burning, it has become more apparent that physical and chemical properties of weathered oil have on the influence of the success or failure of a given technology, when combined with a wide range of environmental conditions.

In the past decade advanced *in-situ* automated measurement technologies (weather, winds, rain, currents, tides, salinity, remote sensing, etc.) have evolved to be able to collect real-time data and information and to transmit these data directly to the *user*.



By Tom Toles, *Buffalo News*, April 17, 1989.

However, these data have not been integrated into a system for utilization by oil spill response decision makers.

The impact of the *Exxon Valdez* oil spill would have been greatly reduced if decision makers had in place at the time of the spill, a real-time operational oil spill response management or advisory system that would enable them to identify "Best Response" for decision making.

6.3. Best Response

Highly effective oil spill response decision making for Best Response (see also Appendix III) requires the development of a system that integrates data from many different sources:

- Existing spill contingency response plans, (strategies and tactics);
- Multiple spill remote sensing images, from single sensors and processes;

- Environmental databases (distribution of environmental sensitive and recreational areas);
- Historical weather analysis (general planning purposes);
- Weather forecast (for operational planning and response);
- Physical oceanographic conditions (tides, currents, winds);
- Local current, wind and temperature (for input to regional and local spill trajectory predictions);
- Spill trajectory predictions;
- Dynamic oil weathering model (prediction of changes of oil properties);
- Oil weathering rates and physical properties;
- Available and equipment and technologies;
- Shipping traffic lanes (location of response capabilities);
- Timing for delivery of response technologies;
- Windows response method and technology selections;
- Emergency offloading equipment; and
- Temporary storage capabilities.

In the past, the lack of a scientific basis for selecting oil spill response technologies promoted "Reasonable" or "Best Available Response". However, today, the public, policy and decision makers, responders, oil companies and tanker owners desire "Best Response". Best Response (which is *Best Response*) mandates that decision making in oil spill response be:

- Scientifically based;
- Technically and environmentally the correct response;
- Able to integrate in real time a wide array of data and information; and
- Reflective of a process of extensive preplanning and training at all levels.

Oil spill response is an extremely complex and challenging cross-disciplinary experience. In the operational decision-making process, it combines a wide range of issues and activities under emergency response conditions that include: the nature of the material spilled, which undergoes changes in physical and chemical properties (weathering) and biodegradation over time, local environmental conditions, sensitivity of impacted natural resources, and selection and effectiveness of response/clean-up technologies.

Planning and decision making in oil spill response requires an understanding of oil weathering processes and the subsequent changes in an oils characteristics and the effect of these changes on response technologies over time. These changes have an important influence on the usefulness and effectiveness of response methods and technologies. Four major categories of response (clean-up) technologies are available:

- Chemical treatment (dispersants, emulsion breakers);
- In-situ burning;
- Mechanical recovery (booms, skimmers, oil-waster separators, adsorbents; and

- Bioremediation (including chemical).

6.3.1. Technology Windows-of-Opportunity Concept

The delineation of technology windows-of-opportunity is a new approach where science and engineering data and information are integrated to provide a scientific foundation for rapid decision making in oil spill planning and response, to optimize environmental and cost benefits by the selection and use of different oil spill response technologies and methodologies. The concept utilizes the following datasets: (1) dynamic oil weathering data for selected oils; (2) actual (real time) environmental data; and (3) dynamic performance data of oil spill clean-up technologies. (For more details see Chapter 7 of this book.)

Recent studies have found, that the time period available for response within a window-of-opportunity, will vary with environmental conditions, oil type, and the degree and rates of changes in oil properties (Nordvik, 1995). Changes in oil properties as a function of time can be measured by use of a stepwise oil weathering method. This weathering method determines changes in evaporation, density, viscosity, pour point, flash point, and emulsification at different degrees of distillation, (weathering) representing different time intervals of spilled oil. A graphical presentation of these data can be plotted by the IKU Dynamic Oil Weathering Model (Aamo et al., 1993).

The two dominant processes that cause changes in oil characteristics over time are evaporation and emulsification, which significantly increase the viscosity of spilled oil. In this book, viscosity is used as a time reference for estimating the window-of-opportunity for dispersants and mechanical recovery equipment including sorbents. Density is used as time reference for density differential oil water separators and emulsification (water content) is used for booms and in-situ burning.

Evaporation of the more volatile components and the formation of a water-in-oil emulsion during weathering occur simultaneously during and after a spill. The rate and extent to which they proceed depends on the chemical composition of the oil and prevailing environmental conditions (such as wind speed, seawater and air temperature, and sea state). The relationships between these factors and the changes in key properties during weathering have to be well understood as well as the effectiveness of specific response technologies under these conditions, in order to estimate and delineate windows-of-opportunity for specific clean-up methodologies and technologies. Therefore, to achieve maximum environmental and cost benefits in implementing response strategies, response tactics and technologies must be chosen to fit the time periods of the technologies windows-of-opportunity.

Recent studies of oil weathering, and the influence of such weathering on performance and effectiveness of specific response technologies (equipment), provide the necessary data to make it possible to identify time periods of windows-of-opportunity. The delineation of these time periods then facilitates the optimization of different response technologies and strategies.

Methods and technologies in each of these categories are limited by environmental conditions both operationally and as a result of the changes in oil characteristics over time. Effective use of dispersants, in-situ burning and some mechanical technologies is limited in time and governed by changes in oil properties. The most efficient, environmentally preferred, and cost effective spill response is dependent on the following factors:

- Chemistry of the spilled product;
- Quantity;
- Location;
- Response time;
- Environmental conditions; and
- Effectiveness of available or pre-positioned response technologies

6.3.2. Oil Weathering and Technology Performance

To enhance the effectiveness of clean-up operations, decision makers need a rapid and accurate tool for predicting changes in oil properties, and a dynamic database containing data and information on the capabilities, capacities, effectiveness, and limitations of response technologies and methodologies. Dynamic oil weathering models have been developed for use in contingency planning and response decision-making. Their reliability and operational output values have greatly improved over the past several years. This progress is a result of advances in model development, data quality and quantity.

Decision-making in oil spill response requires an understanding of oil weathering processes and subsequent changes in the characteristics of the spilled oil over time. These changes have an important influence on the usefulness and effectiveness of response methods and technologies. Three major categories of response (clean-up) methods are available: (1) mechanical recovery; (2) chemical treatment; and (3) in-situ burning. Methods and technologies in each of these categories are limited by environmental conditions both operationally and as a result of the changes in oil characteristics over time.

Dynamic oil weathering models have been developed to predict changes in oil properties over time and have been used as a decision-making tool in actual spill and spill scenario over the past several years in particular to assess use of dispersants. Integration of a technology database, using changes in specific oil characteristics as a time reference has further improved decision-making capabilities.

In addition to dispersants, effective use of in-situ burning and some mechanical technologies is limited in time and governed by changes in oil properties. The most efficient, environmentally preferred, and cost effective spill response is dependant on the following factors: chemistry of the spilled product, quantity, location, response time, environmental conditions, and effectiveness of available response technologies

(given the first five factors). Utilization of multiple response technologies requires a rapid and scientifically-based decision-making tool and an integrated system of response capabilities.

6.3.3. The Dispersant Window-of-Opportunity

The operational limitations of dispersant applications are dependent on application methods, equipment, average droplet sizes of the dispersant, environmental conditions (such as wind speed, sea state, salinity, and temperature), oil thickness and dosage rates, and the distribution of the oil on the sea surface at the point of application. The use of a dispersant is considered to be a rapid response method and has the potential to greatly enhance the degree of natural dispersion. Dispersants also have logistical advantages compared to contained in-situ burning and mechanical clean-up (no waste to process). Effective use of dispersants is for some oils very limited in time.

Four factors are believed to have a major impact on the effectiveness of dispersants: pour point, viscosity of the oil and emulsion, emulsion water content, and emulsion stability. Most crude oils and heavier refined products will form emulsions. Weathering causes an increase in the viscosity of oil, raises its pour point, and increases the water content and the degree of stability of an emulsion. All of these changes tend to make oil less dispersible as the viscosity of the oil or emulsion approaches its limiting value. The value of this limiting viscosity depends on the type of the spilled oil and the prevailing environmental conditions.

For a given oil emulsion, dispersant treatment windows-of-opportunity can be estimated by combining emulsion viscosity data from effectiveness testing data with IKU Oil Weathering Model prediction of emulsion viscosity as a function of time. The data plotted in this figure cover three windows of defined dispersibility as defined from the MNS and IFP test criteria (dispersible, reduced dispersibility, and non-dispersible).

Laboratory effectiveness results for dispersants can not be directly transferred into performance data during spill response. However, laboratory results are of value for guiding the selection of an appropriate dispersant during contingency planning and response. Recent dispersant field-testing has established a relationship between laboratory and field effectiveness data for good, medium and poor dispersants.

6.3.4. The Window-of-Opportunity for In-Situ Burning

The window-of-opportunity for ignition and burning will vary, depending on environmental conditions, physical properties and chemical composition of the spilled oil. The rate of evaporation and emulsification and the subsequent changes in flash point, viscosity, water content, and stability of an emulsion have a major influence on ignition technologies and the usefulness of in-situ burning. In addition, sea temperature, wind speed, thickness of the oil layer, heat transfer from the burn to the surface of the oil or emulsion, and the loss of heat through the oil to the underlying water limit

the use of in-situ burning as a response method (Guénette et al., 1994). The removal effectiveness under experimental conditions has been reported from zero percent for emulsified and weathered oils and up to 99% for fresh oils.

The method of calculating in-situ burning effectiveness is based upon a volumetric reduction of oil from a closed system. In comparing data for burning operational effectiveness with a fire resistant boom to mechanical or dispersant operational effectiveness data, one must consider the loss of oil from the towed boom system which under environmental and operational conditions can vary widely, and the release of soot and smoke which can account for 10–15% of the removed mass of oil.

The preliminary and valid arguments for considering in-situ burning as a response measure are that it extends the options for response by providing a useful supplemental tool, while decreasing the dependency on recovered oil and water storage needs. The latter remains a limiting factor for large catastrophic spills, especially for response systems built for vessels of opportunity.

Ignition and combustion are dependent on the flash point and release of ignitable and combustible vapor. It is the vapor released from the oil that burns and not the oil as a liquid. Thus, the mechanism for maintaining a sufficient amount of vapor for continuous burning is vital to in-situ burning. When the flash point temperature of the oil exceeds the sea temperature, the surface of the oil needs to be heated by an external source to promote the release of flammable vapor that can be ignited. Ignition and burning is also restricted by increased water content, heat transfer to the under lying seawater, viscosity and stability of the emulsion. When water-free oil is burning on the top of a layer of emulsion, the temperature within the emulsion can not exceed approximately 100 °C. A limit for ignition may also occur if the flash point of the oil is above the temperature that can be created or maintained on the surface of an emulsion.

For most crude oils, approximately 25% evaporation and or a 50% water content restrict a time window for ignition and sustained burning of weathered oil using conventional ignition technology. The estimated time window-of-opportunity for ignition and in-situ burning of ANS and Bonnie Light crude oils based upon 5 m/s wind speed, water temperature of 15 °C, and the time to reach 50% water content is presented in Table 6.1. Also included is the time it takes for 25% of the oil to evaporate,

Table 6.1

Estimated time windows for ignition based upon predicted 25% evaporation and 50% water content at 15 °C and a wind speed of 5 m/s using data from the IKU Oil Weathering Model.

Oil	25% Evap. (hours)	50% Emulsified (hours)	Evap. at 50% Water (%)	Viscosity at 50% Water (cP)	100 °C Flash point (hours)
ANS	72	36	22	1500	160
Bonnie Lt.	12	1	10	200	70

percentage of oil evaporated when the water content is 50% plus corresponding viscosity, and time estimate to raise the flash point to 100 °C. After this time it will be almost impossible to ignite an emulsified oil slick with conventional ignition technologies. A case example for in-situ burning of ANS is presented in Appendix V.

6.3.5. Integrating Data and Information for Spill Response Management

Utilization of multiple response technologies requires a rapid and scientifically-based decision-making tool and an integrated system of response capabilities. Rapid oil spill response decisions are of vital importance to mitigate and reduce environmental damage. Remote sensing data have become an important factor in the decision-making process in order to determine the extent of the spill (satellite images) and level of response needed and for operational direction of resources (aircraft images) in clean-up. For dispersant and in-situ burning, decisions needs to be made immediately in order to respond within the first 2–24 hours after a marine oil spill has occurred.

Highly effective spill response requires the integration of data from many different sources:

- Environmental databases (distribution of environmental sensitive and recreational areas);
- Historical weather analysis (general planning purposes);
- Weather forecast (for operational planning and response);
- Physical oceanographic conditions (tides, currents, winds);
- Local current, wind and temperature (for input to regional and local spill trajectory predictions);
- Spill trajectory predictions;
- Dynamic oil weathering model (prediction of changes of oil properties); and
- Oil weathering rates and physical properties.

Oil spill response management in the past decade has evolved advanced remote and mobile systems to collect data and information and to transmit them directly from the spill to response policy and decision makers. These new scientifically based tools, can integrate several data sources, to bring together the impact of weather, sea state, wind, current and water temperature, the physical and chemical properties and characteristics and trajectory of the spill oil for identification of the time periods that specific response methods and technologies are most effective.

Oil spill response decisions (or lack of) made immediately (and in the first 4–48 hours) after a marine oil spill has occurred can be the single largest factor that will influence the total cost of oil spill response and the degree of environmental impact.

Major oil spill incidents over the past decade have led to development of more specific and stringent requirements and regulations in many countries around the world, followed by establishment of response organizations using clean-up methods,

ruled by governmental policies and environmental concerns. Response methods are therefore quite varied among the countries around the world, even for the same spill of oil. The ability of a spill responder to use the best science and the most effective response methods in dealing with oil spills has been quite limited.

Ideal marine oil spill response strategy and tactics should focus on the use of the most rapid, efficient and cost-effective response methods and technologies. Use of the most effective response method and technologies require access to reliable, national and international accepted data, based upon a scientific and engineering approach. The windows-of-opportunity concept, with the combined information from dynamic oil weathering model and performance technology databases can become a decision-making tool identifying and defining the window of effectiveness of different response technologies (methods and equipment) under given environmental conditions.

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Chapter 7

The Technology Windows-of-Opportunity Oil Spill Response Strategy*

7.0. Technology Windows-of-Opportunity

Definition: *Technology Windows-of-Opportunity:* The various time periods for effective utilization of marine oil spill response technologies and methodologies in clean-up operations.

This chapter is an overview of the Technology Windows-of-Opportunity Strategy from its development in the 90s as our understanding of the science of the weathering of spilled oil has evolved. The weathering (changes in an oil due to exposure to the environment) of oil was initially assumed to be a simple aging process of the mixture of oil in water. Studies have found it to be a complex physical, chemical and biological process, with our understanding of it still evolving today.

7.0.1. Introduction—Historical Perspective

In the late 70s, a few oil companies began to develop and market chemicals as dispersants or emulsion breakers, with the idea that they could be used to treat spilled oil and reduce clean-up and environmental damage. The early work was primarily with fresh oil, and stemmed from oil company laboratories and refineries. In the 80s, as these chemicals were tested and evaluated on oil spills, the results were found to be mixed and difficult to compare (Mackay et al., 1980; Mackay and Zagorsky, 1982; Ross, 1986). This led Esso, Exxon, and Fina to fund extensive research and development at IKU (Institutt for Kontinentalsokkelundersøkelser og Petroleumsteknologi), AEA (Warren Springs), and subsequently at Battelle Ocean Sciences and COSS at Texas A&M University to test the effectiveness of these products on oil spills. The results of early studies could not be compared, because the weathered oils were prepared

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in many different ways. The initial studies at IKU and in the North Sea led to the realization that the oil continued to change or weather after it was spilled and that it varied over time of exposure and conditions in the environment. In addition, early researchers realized a need for a standard method to prepare standardized weathered samples which were representative of a standard time period of exposure to the environment for treatment with dispersants or emulsion breakers (Brandvik and Daling, 1991; Daling and Brandvik, 1991; Nordvik et al., 1992).

The necessity was to develop a standard process that could produce a weathered oil, which would yield "standardized" or "reproducible" consistent weathered oil samples at different time intervals representing variable exposure of the oil to the environment. This led to the development of the Step-Wise-Laboratory Weathering Method/Process at IKU (Daling et al., 1990, 1993a; Daling and Almås, 1988; Daling and Brandvik, 1991; Hokstad et al., 1993; see Walker et al., 1993). With the Step-Wise-Weathering Method standardized, researchers could then develop response diagrams for a given technology measuring the efficiency of a given technology at different times (meaning time periods of weathering). Research at IKU by, Aamo, Daling, Reed (Aamo et al., 1993), and others (Johansen, 1991) led to the modeling of weathered oil.

Then the Oil Companies funded studies to test their dispersants and emulsion breakers with weathered oils. With the need to reduce recovered oil storage capacity on response ships by separating out the water that was initially picked up with the oil and discharging this water back overboard, Knappstad (1981), Lode (1981), Hokstad and Brandvik (1993), Hokstad and Daling (1993) and others tested the effectiveness of different emulsion breakers with specific oils. Subsequently, the International Advisory Committee on Water in Oil Emulsions (IACE) was established with the aim of improving the understanding of the formation and stability of emulsions needed for improvement of model predictions (Lee, 1999).

About the same time environmental regulatory agencies were becoming involved in regulating the development and production of oil from offshore waters. They quickly realized that the oil being produced from a given field was similar. They realized that in a given oil field that the oil spill response contingency plan for that field could specify that the responsible party use specific clean-up and response means—i.e., technologies. In addition, these spill response technologies could be specific to disperse a given produced oil and that these products be stored in that field in such a manner to be available for response to a spill. They also required platforms to have the "right" or correct emulsion breakers on hand. These actions brought together the interests of regulatory agencies and the public concern for protection of the environment for the utilization of the most effective products and equipment used to reduce environmental damage. Cost benefits were also obtained because the chemicals were NOT used on the wrong oil or at an inappropriate time period.

The development of the Step-Wise-Weathering Process was a significant advancement in the field of oil spill response, it led to the implementation of testing under

different types of oils and degrees of weathering. For dispersants, an international committee was established: "International Dispersant Effectiveness Testing Committee" (IDETC). Standardization led to the ability to compare and accept results from different institutions. Data from different institutions could be combined in databases allowing plotting of efficiency diagrams over a range of environmental conditions and for different oils. In 1994, the International Oil Weathering Committee (IOWC) was established in order to improve the overall modeling effort.

The following were extensively involved in this early work:

In Norway:	**IKU:** *Per S. Daling, Per J. Brandvik, T. Strøm-Kristiansen,* Ivar Singsaas which subsequently was reorganized in to SINTF Chemistry **SINTF:** *O. M. Aamo, Mark Reed, Hans Jensen*
In France:	**CEDRA:** *Franqois_X. Merlin*
In the UK:	**AEA:** (former Warren Springs Laboratory): *Alan Lewis, Tim Lunel*
In Canada:	*University of Toronoto: D. Mackay* **Environment Canada:** *M. Fingas, A. Harry Whitticar*
In the US:	**MSRC:** *Atle B. Nordvik* **Battelle Ocean Science:** *Stanley A. Ostazeski, Jerry M. Neff* **Ohmsett—MMS** *Joe Mullin and Ken Bitting* (**USCG**) began testing with Different Oils **IDETC** *Merv Fingas:* Environment Canada—Standard Methods *A. Harry Whiticar:* Environment Canada, Testing of Mechanical Equipment (Skimmers) *David Cooper:* Environment Canada, Testing of Sorbents *Richard Lessard:* Exxon R&D, Dispersants *Robert Fiocco:* Exxon R&D, Dispersants

7.0.2. Weathering of Oil

When crude oil and refined products are accidentally released to the marine environment, they are immediately subject to a wide variety of weathering processes that change the physical and chemical characteristics of the oil. The weathering processes include spreading, evaporation, water-in-oil emulsification, dispersion, dissolution, photochemical oxidation, microbial degradation, adsorption onto suspended particulate materials, sinking and degradation.

The largest activity is the uptake or incorporation of water into the oil. As oil emulsifies, it forms a stable water in oil emulsion, which can include up to 70 or 80% water. This affects the efficiency of a response (clean-up technology). For instance, a stable water-in-oil emulsion with over 50% water will not burn unless water is

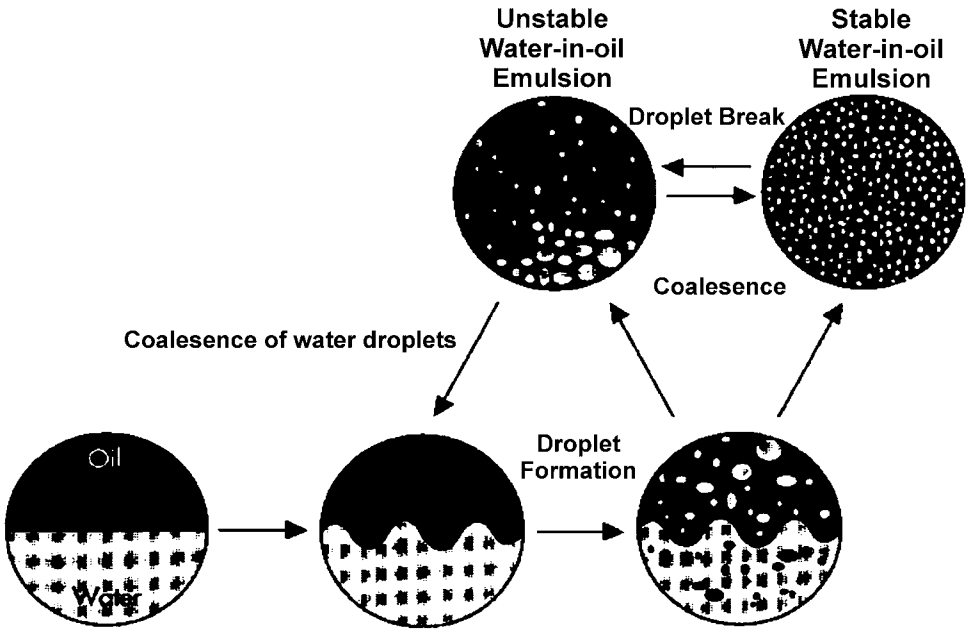


Fig. 7.1. Illustration of the formation of an emulsion as a spilled oil weathers into a stable water-in-oil emulsion which can incorporate up to 70–80% water in oil over time (Lewis and Walker, 1993; Lee, 1999).

removed by heat or an emulsion breaker. The amount of water incorporated into a stable* water-in-oil emulsion depends upon the type of oil and the environmental conditions (temperature, degree of mixing due to wave action, sea state, rain, etc) that influence the weathering of oil.

The three dominate weathering processes causing changes in oil characteristics over time are spreading, evaporation, and emulsification. They all occur progressively as oil weathers, at rates which depend on the oil composition and the prevailing environmental conditions (such as wind speed, waves, mixing, sea state, seawater and air temperature). Spreading reduces oil thickness, and evaporation increases flash point, pour point, density, and viscosity. In addition, emulsification significantly increases the viscosity of spilled oil and reduces the differential density of seawater and oil residue emulsion, which can reduce the reserve buoyancy of oily sorbents.

In the US, the USCG was focusing on obtaining what would subsequently be called **Best Response** given weather and available equipment, people, and technologies (see Section 2.3 of this book). In contingency planning, massive warehouses were being developed to have oil spill response technologies, equipment and supplies as close as possible to potential sites of spills to expedite the response. At the Marine Spill Response Corporation (MSRC), projects lead by Atle B. Nordvik in Research

* When the droplet size in emulsified oils have reached a small enough size so that the forces of gravity do not naturally separate them, the emulsion is termed stable.

and Development were trying to calibrate weathering of oil against the effectiveness of a given technology. The researchers realized that efficiency of a given technology was not only linked to operator efficiency but also to the stage of weathering that the spilled oil had undergone.

This led Nordvik (at MSRC R&D) to fund standardized testing protocols that could be used in the field to measure the degree of weathering or emulsification of spilled oil in equipment (technology) performance tests (Nordvik et al, 1992, 1993, 1994, 1995). As the IKU models were verified through mesoscale (Singsaas et al., 1992) and field-testing (Lewis et al., 1998a, b) and more oils evaluated, it became apparent to Nordvik that time periods of effectiveness could be predicted for a given spilled oil. These time periods could be correlated to the performance effectiveness data of a given technology to provide the necessary data to make it possible to predict the most appropriate time periods to utilize a given technology following a spill (Nordvik et al., 1993).

This led to the development of the "Technology Windows-of-Opportunity Concept" with a direct scientific and engineering technical basis for oil spill contingency planning and decision making for response (Nordvik, 1995; Nordvik et al., 1995a, b, c; Champ et al., 1997a, b, 1998; Champ and Ornitz, 1999). The delineation of these windows then facilitates the optimization of different response technologies and strategies. This optimization is the basis for Best Response (see Sections 2.2 and 2.3 of this book).

The concept utilizes technology performance effectiveness data of a given technology derived from scientific and engineering laboratory, mesoscale, and experimental field studies. In this approach, performance effectiveness data have been correlated to a wide range of viscosities of different weathering stages of oils into a dynamic oil weathering database to identify and estimate time periods, called "technology windows-of-opportunity".

In these windows, specific response methods, technologies, equipment, or products are more effective during clean-up operations for specific oils as influenced by different degrees of weathering under a range of environmental conditions. Figure 7.1 is presented to illustrate the formation of an emulsion as a spilled oil weathers. Combining spill trajectories with natural resource maps and sensitive environmental areas to the windows approach will provide a significant improvement in planning and response.

Evaporation and emulsification are the two dominant processes that cause changes in oil characteristics. Both significantly increase the viscosity of spilled oil. Evaporation of the more volatile components and the formation of a water-in-oil emulsion during weathering occur simultaneously during and after a spill. Emulsification is the incorporation of water into oil and not visa versa (see Figure 7.1).

The relationships between these physical factors and the changes in key properties during weathering and the effectiveness of specific response technologies under these conditions needs to be well understood in order to estimate and delineate windows-

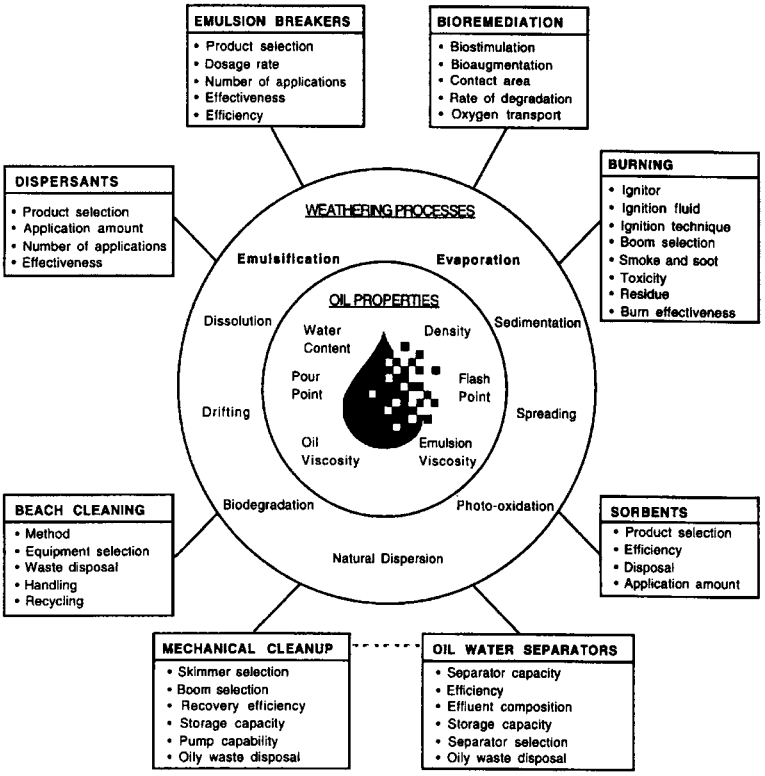


Fig. 7.2. Oil weathering processes impacts the effectiveness of selected technologies for oil spill response.

of-opportunity for specific clean-up methodologies and technologies. Maximum environmental and cost benefits in implementing response strategies are achieved when responders choose tactics and technologies to fit the windows-of-opportunity for each technology.

In Figure 7.2, an illustration of the technology windows-of-opportunity concept is presented that was first published in Nordvik (1995) to identify the properties of oil and how the oil weathering process impacts the effectiveness of selected technologies.

7.0.3. IKU Oil Weathering Model and Technology Performance Databases

Collecting oil weathering data at sea during an open ocean oil spill has many limitations including a rapid "standardized" field measurement method, variation to relative position to the discharge, relative position in the slick (downstream, or across the plume) and sea state at the least. This has led to the development of oil weathering models based on data collected from laboratory, mesoscale and field studies. Mullin and Lane (2000) have discussed the pros and cons of these test strategies

relative to testing, calibrating and evaluating the effectiveness of marine spill response technologies and equipment (see box below).

Marine Spill Response Equipment Testing comes in three sizes and capabilities:

(1) **Laboratory**—Bench Top Testing or Modeling—with maximum control of selected test conditions over environmental conditions, providing a high degree of precision, sensitivity and reproducibility for data, information, and understanding of processes involved.

(2) **Mesoscale**—Outdoor Environmental Testing—is a system simulating environmental conditions with a limited range of controls and conditions, offering repetitive evaluation of full scale equipment or technology performance under repetitive test conditions to determine variability of performance.

(3) **At-Sea Trials**—Open Ocean Testing with minimum experimental controls and control of environmental conditions and exposure to maximum natural variabilty and number of variables, providing maximum verification.

Environmental equipment and technology testing is usually considered a three-step process. Results from all three are used to redesign and or develop new technologies. Data and information from each step of testing are used to refine a product. Success in the laboratory or modeling usually leads to onshore mesoscale testing (wave tank), which is considered a screening test or first real equipment performance test because actual (either full size or to scale) equipment can be tested. Mesoscale tank testing of actual equipment is highly desirable because it is less expensive than offshore testing and has far less environmental impact and offers a range of environmental and experimental controls that are not available offshore. Equipment or technologies failing at this test level will not be tested offshore. Offshore testing is considered the final test for verification. For final product marketing, at sea testing is more valuable than tank testing, because most tank testing have limitation on wave heights (max 1.0 m), sea states or environmental conditions that it can generate. Since many oils spills are associated with storm events and high sea state, at sea testing is considered final verification of both equipment and support personal performance and requirements.

To enhance the effectiveness of clean-up operations, decision makers need rapid and accurate tools for predicting changes in oil properties, and a dynamic database containing data and information on the capabilities, capacities, effectiveness, and limitations of response technologies and methodologies (Engelhardt, 1994). These databases will lead to the development of oil weathering models to predict the change in weathering over time as related to environmental conditions (salinity, temperature, waves, wind, and sea state).

Models have been developed to predict oil weathering, trajectory, and dispersion for use in contingency planning and response decision making. Their reliability and

operational output values have greatly improved over the past several years. This progress is a result of advances in model development, data quality and quantity (Nordvik et al. 1992; Yapa et al., 1997; Reed et al., 1999; Reed, 2000) and the papers and references cited in these special volumes of *Spill Science & Technology Bulletin* that were dedicated to modeling. In addition, an excellent summary is presented in McCay (2001). However, to predict changes in oil properties and weathering over time, a dynamic database containing information on the physical and chemical properties of weathered oil is required.

The approach developed for the windows concept combines data from an Oil Weathering Model (Aamo et al., 1993) developed by IKU in Norway with a technology performance database to predict changes in performance characteristics over time and a wide range of environmental conditions. The oil-weathering model has been calibrated by an empirical approach using data obtained from laboratory analyses, oil data derived from a comprehensive stepwise weathering test procedure in flume tank testing, and experimental spills at sea.

The experimental results lead to subsequent development and modification of algorithms and use of correlation factors for individual oils to allow for the prediction of the response curve for a selected property (evaporation, emulsion viscosity, pour point, etc.) of an oil as it weathers over time, see Figure 7.3 (from Strøm-Kristiansen et al., 1993a). The strength of the IKU model lies in its use and verification of oil weathering data (Strøm-Kristiansen et al., 1993b).

The experimental results led to subsequent development and modification of the model algorithms and use of correlation factors for individual oils to allow for the prediction of the response curve for a selected property (evaporation, emulsion viscosity, pour point, etc.) of an oil as it weathers over time.

7.1. Examples of Technology Windows-of-Opportunity

The delineation of technology windows-of-opportunity for a given technology requires: (1) the integration of environmental and technical data and information to provide a scientific and engineering foundation for rapid decision-making in oil spill planning and response. This process will optimize environmental and cost benefits by the selection and use of different oil spill response technologies and methodologies at the most appropriate time periods. The concept utilizes the following datasets: (1) dynamic oil weathering data for selected oils; (2) actual environmental data; and (3) dynamic performance data of oil spill clean-up technologies.

Changes in oil properties as a function of time can be measured by use of the Step-Wise Oil-Weathering Laboratory Method (see Section 7.0.1 of this book). This weathering method determines changes in evaporation, density, viscosity, pour point, flash point, and emulsification at different degrees of distillation, (weathering) representing different time intervals of spilled oil. Recent studies have found that the time

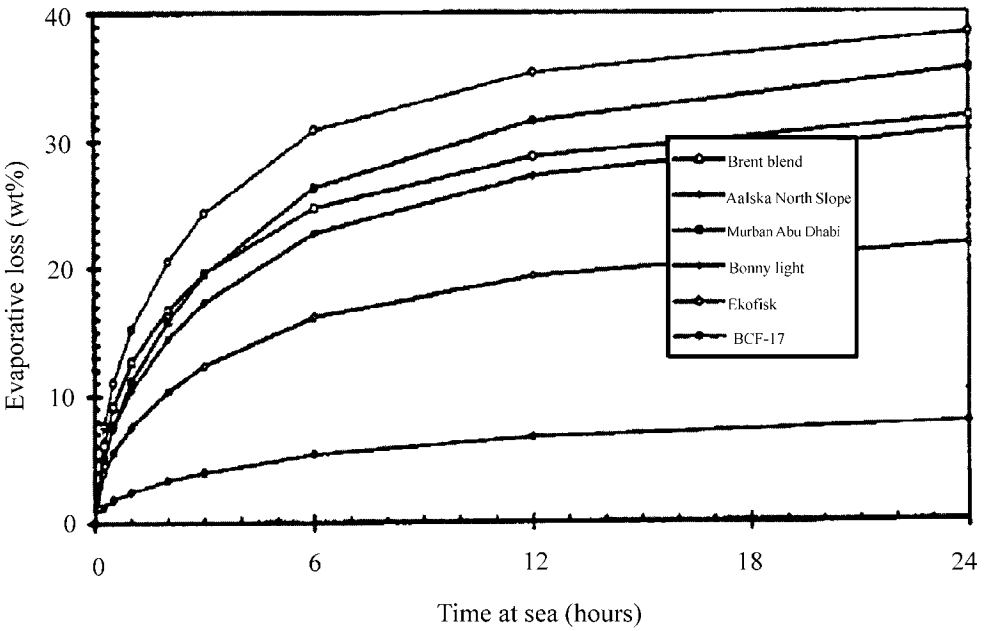


Fig. 7.3. IKU Oil Weathering Model predictions for the degree of evaporation as a function of time at sea for selected crude oils. Predictions have been calculated at 5 m/s wind speed and with a water temperature of 15 °C.

period available for response within a window-of-opportunity will vary with environmental conditions, oil type, and the degree and rates of changes in oil properties (Nordvik, 1995).

The two dominant processes that cause changes in oil characteristics over time are evaporation and emulsification, which significantly increase the viscosity of spilled oil. In this book, viscosity is used as a time period reference for estimating the window-of-opportunity for different oil spill response technologies. These technologies include in-situ burning, dispersants, mechanical recovery equipment and sorbents. Density is used as a time period reference for density differential oil water separators and emulsification (water content) is used for booms and in-situ burning.

Evaporation of the more volatile components and the formation of a water-in-oil emulsion during weathering occurs simultaneously during and after a spill. The rate and extent to which they proceed depends on the chemical composition of the oil and prevailing environmental conditions (such as wind speed, seawater and air temperature, and sea state).

An example of estimated technology windows-of-opportunity in hours for selected technologies and for indicated specific oils that data are available for is presented in Table 7.1 (from Nordvik, 1995). These windows are presented as a comparative example of the uniqueness and specificity of the technology windows-of-opportunity concept for selected oils, response methods and technologies under given environ-

Table 7.1

Summary of estimated windows-of-opportunity for selected marine spill response technologies for specific oils under certain environmental conditions. The oils are Bonnie Light, Alaska North Slope (ANS), BCF 17, and BCF 24. The environmental conditions include a wind speed of 5 m/s with a seawater temperature of 15 °C. Windows-of-opportunity have been estimated for the indicated technologies and oils.

Technology/oil	Bonnie Light	ANS	BCF 17	BCF 24
In-situ burning	0–1	0–36		
Oil-water separator	0–24	0–18		
Disk skimmer			0–10	0–72
Brush skimmer			0–10*	0–72*
			>10	>72
Dispersant	0–4	0–26		
	4–8*	26–120*		
Sorbent			0–36	0–12
			36–96*	12–240*

* = Reduced effectiveness.

mental conditions as determined by relationships of physical and chemical properties data from the IKU Oil Weathering Model (Nordvik, 1995).

7.1.1. Dispersants

The early research on dispersants has been summarized in several documents (API, 1986) and by the Committee on Effectiveness of Oil Spill Dispersants (NRC, 1989) and the references therein. In addition, many dispersant papers have been published in the Proceedings of the International Oil Spill Conference (IOSC) and the some 23 published proceedings of the Arctic and Marine Oilspill Program (AMOP) Technical Seminars. At the 1997 International Oil Spill Conference, a special summary was prepared by Lewis and Aurand (1997) on "Putting Dispersants to Work: Overcoming Obstacles." Dispersants have suffered limited acceptance as a spill response technology by being considered another chemical that would be added to the marine environment during an oil spill. The operational limitations of dispersant applications are dependent on:

- Application methods;
- Equipment;
- Average droplet sizes of the dispersant;
- Environmental conditions (such as wind speed, sea state, salinity; and temperature);
- Oil thickness and dosage rates; and
- The distribution of oil, on-the-sea-surface, at the point of application.

Table 7.2

Estimated dispersant time windows-of-opportunity for dispersibility of ANS and Bonnie Light emulsions if treated with Corexit 9527® based on emulsion viscosity data as developed from the IKU Oil Weathering Model for 5 m/s wind speed and 15 °C seawater surface temperature.

Oil	Viscosity (cP)/(hrs)		
	Dispersible	Reduced dispersibility	Not dispersible
ANS	<1000/(<26)	1000–10,000/(26–120)	>10,000/(>120)
Bonnie Light	<500/(2)	500–2000/(2–4)	>2000/(>4)

The use of a dispersant is considered to be a rapid response method and has the potential to greatly enhance the degree of natural dispersion. Dispersants also have logistical advantages compared to contained in-situ burning and mechanical clean-up. For example, there is no waste to process from the use of dispersants. Effective use of dispersants for some oils is very limited in time. A dispersant can be applied in relatively high sea states (with low wind) as long as the plane can fly and the dispersant can be sprayed and reach the surface of the slick. Four factors have a major impact on the effectiveness of dispersants:

- Pour point;
- Viscosity of the oil and emulsion;
- Emulsion water content; and
- Emulsion stability.

Most crude oils and heavier refined products will form emulsions. Weathering causes an increase in the viscosity of oil, raises its pour point, and increases the water content and the degree of stability of an emulsion. All of these changes tend to make oil less dispersible as the viscosity of the oil or emulsion approaches its limiting value. The value of this limiting viscosity depends on the type of the spilled oil and the prevailing environmental conditions.

For a given oil emulsion, dispersant treatment windows-of-opportunity can be estimated by combining emulsion viscosity data from dispersant effectiveness testing data with IKU Oil Weathering Model prediction of emulsion viscosity as a function of time, see Figure 7.4 (Strøm-Kristiansen et al., 1993b).

The data presented in Table 7.2 identify three windows of defined dispersibility as defined from the MNS and IFP test criteria. Comparative data for ANS and Bonnie Light have been extrapolated from Figure x type plots and presented in Table 7.2 to identify the estimated time windows for dispersibility for the three defined dispersant windows-of-opportunity categories (dispersible, reduced dispersibility, and non-dispersible) from the MNS and IFP test criteria for Corexit 9527®.

Laboratory effectiveness results for dispersants can not be directly transferred into performance data during spill response, due to limitations in laboratory test methods

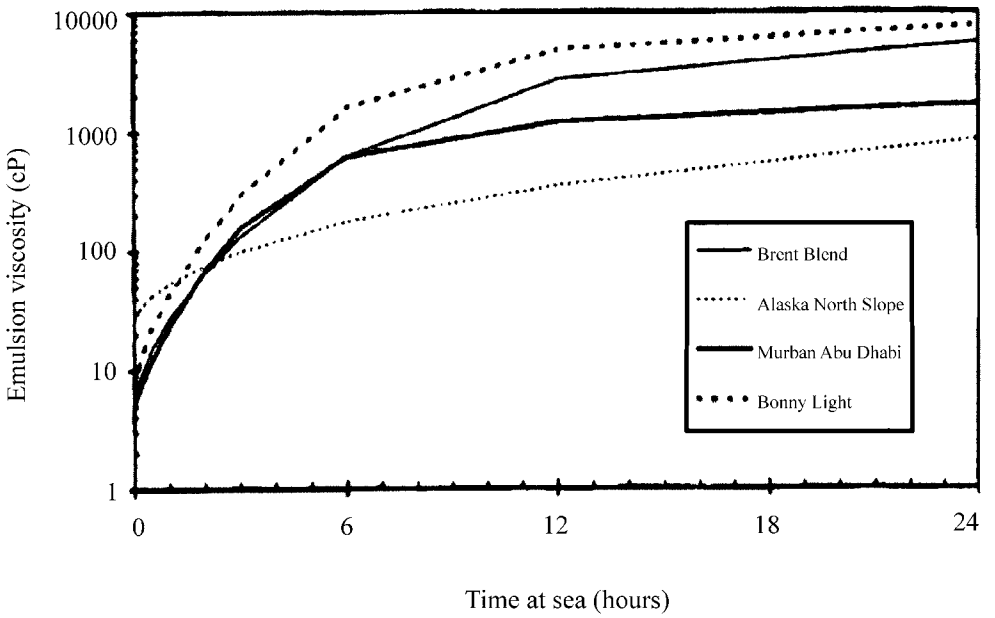


Fig. 7.4. A plot from the IKU Oil Weathering Model of viscosity over time for Bonnie Light emulsions at 5 m/s wind speed and with a seawater temperature of 15 °C.

to mimic environmental conditions at sea and the lack of field operational effectiveness data. However, laboratory results are of value for guiding the selection of an appropriate dispersant during contingency planning and response. Recent dispersant field-testing has established a ranking between laboratory and field effectiveness data for good, medium and poor dispersants (Lunel et al., 1995).

7.1.2. In-Situ Burning

A good source of background information relative to in-situ burning, is the Proceedings of a Workshop held in New Orleans by NIST (National Institute of Standards and Technology) and MMS (Minerals Management Service), Walton and Jason (1998) and a recent publication by Environment Canada (Fingas and Punt, 2000) which is an extensive overview of the science of burning. In addition a paper by Nordvik et al. (In Press), is a review of the processes and factors for estimating time windows for in-situ burning at sea. The interest in using in-situ burning as a spill response technology is related to its ability, if implemented at the start of a spill, to greatly reduce the volume of spilled oil.

The window-of-opportunity for ignition and burning will vary, depending on environmental conditions, physical properties and chemical composition of the spilled oil. The rate of evaporation and emulsification and the subsequent changes in flash

point, viscosity, water content, and stability of an emulsion have a major influence on ignition technologies and the usefulness of in-situ burning. In addition, sea temperature, wind speed, thickness of the oil layer, heat transfer from the burn to the surface of the oil or emulsion, and the loss of heat through the oil to the underlying water limit the use of in-situ burning as a response method (Guénette et al., 1994). The removal effectiveness under experimental conditions has been reported from 0% for evaporated and emulsified oils up to 99% for fresh oils.

The method of calculating in-situ burning effectiveness is based upon a volumetric reduction of oil from a closed system. In comparing data for burning operational effectiveness using a fire resistant boom with mechanical or dispersant operational effectiveness data, one must consider the loss of oil from the towed boom system. Under environmental and operational conditions loss can vary widely (Nordvik, 1995). The release of soot and smoke can account for 10–15% of the removed mass of oil (Fingas et al., 1996a, b; Walton et al., 1994, 1995; Wang et al., 1999.)

The preliminary and valid arguments for considering in-situ burning are that it extends the options for response by providing a useful supplemental tool, while decreasing the dependency on recovered oil and water storage needs. The latter remains a limiting factor for large catastrophic spills, especially for response technologies built for vessels of opportunity.

In addition, in-situ burning may protect the environment, wildlife resources, and human health and safety by removing oil quickly and effectively from the sea surface. In-situ burning can be considered a viable oil spill response method, only if data on ignitability for fresh and weathered crude oils and refined products are available to estimate the time window-of-opportunity in contingency planning and response. Appendix V is a draft manuscript developed by Nordvik, Champ and Bitting for the USCG that focuses on the science of in-situ burning and prepares a case example of the steps that one would undertake to estimate the time windows to in-situ burn a spill of Alaska North Slope (ANS) oil.

For in-situ burning, this requires the development of an ignitability database, based upon basic physical and chemical processes of weathered oil. It is pointless to consider the use of in-situ burning as a response in circumstances where it will not be feasible, such as where the oil will not burn. Several groups of key factors determine the success of an in-situ burning operation.

The first group is related to *flammability* and *ignitability* of floating oils and are tied to:

- Oil composition and molecular weight;
- Vapor pressure, flash point, boiling point and evaporation rate; and
- Sea temperature and air movements (wind).

The second group is related to the *changes in oil properties* due to oil weathering during the response time, defined as the time from the onset of the spill to ignition.

Weathering processes that have great influence on ignitability and effectiveness of in-situ burning are evaporation and emulsification.

The third group contains operational and technical considerations, and includes the capability of the resources (vessel and booms) to contain and thicken floating oil, durability of fire-resistant booms and the capabilities of the ignition source to elevate the oil surface temperature to the fire point temperatures where ignitable vapor–air mixtures can be developed.

Use of in-situ burning require knowledge and understanding of the basic processes that limits and leads to formation of ignitable vapor–air mixtures, and how changes in oil composition will affect ignition and sustained burning.

Ignition and combustion are dependent on the flash point and release of ignitable and combustible vapor. It is the vapor released from the oil that burns, not the oil as a liquid (Guénette et al., 1994). Thus, the mechanism for maintaining a sufficient amount of vapor for continuous burning is vital to in-situ burning. When the flash point temperature of the oil exceeds the sea temperature, the surface of the oil needs to be heated by an external source to promote the release of flammable vapor that can be ignited.

Ignition and burning is restricted by increased water content, heat transfer to the underlying seawater, viscosity and stability of the emulsion. When water-free oil is burning on the top of a layer of emulsion, the temperature within the emulsion can not exceed approximately 100 °C. A limit for ignition may also occur if the flash point of the oil is above the temperature that can be created or maintained on the surface of an emulsion.

The rates of evaporation and emulsification and subsequent changes in flash point, viscosity, water content, and stability of an emulsion have a major influence on ignition technologies and the usefulness of in-situ burning. In addition, sea temperature, wind speed, thickness of the oil layer, heat transfer from the burn to the surface of the oil or emulsion, and the loss of heat through the oil to the underlying water limit the use of in-situ burning as a response method. Estimated in-situ burning windows-of-opportunity for several oils are plotted in Figure 7.5 utilizing water content and flash point as a function of time to present the difference between oils. Estimates have been made at 5 m/s wind speed and with a seawater temperature of 15 °C using data from the IKU Oil Weathering Model. Oils in the bottom 1/3 of the graph can be highly flammable, the next 1/3 will burn and the last 1/3 are above the flash point.

7.1.3. Mechanical Clean-up Technologies

The windows-of-opportunity time periods that exist for use of mechanical clean-up response methods and technologies can be based on two different variables. The first is related to the changes in oil properties (weathering over time), and the second is related to environmental conditions due to limited maneuverability, operability, and capabilities of resources, techniques, and equipment. Both are dependent on environ-

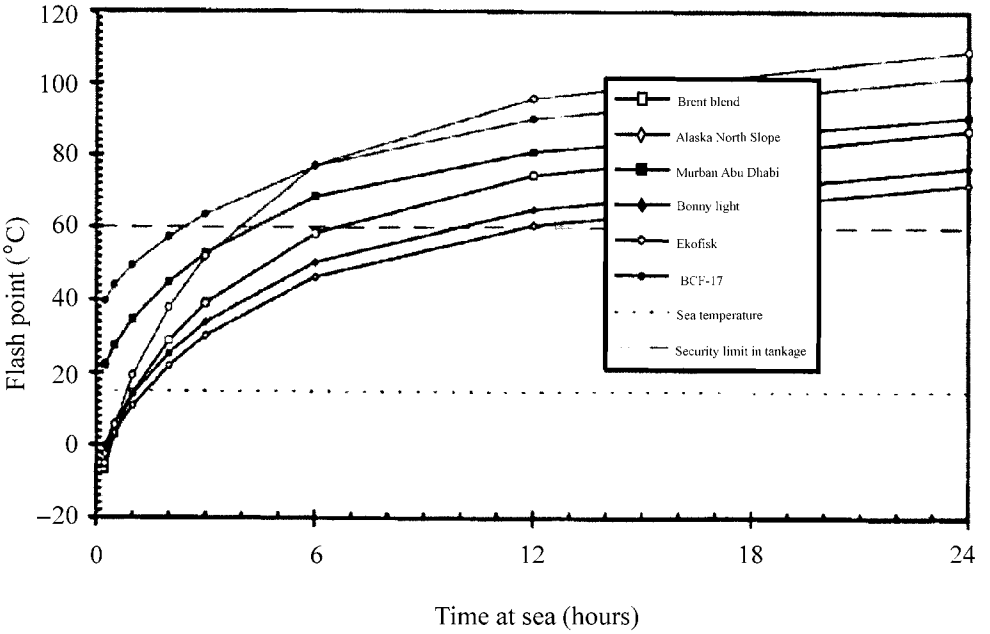


Fig. 7.5. IKU Oil Weathering Model predictions of flash point as a function of time at sea for selected crude oils. Predictions have been calculated at 5 m^{-1} wind speed and with a seawater temperature of 15 °C.

mental factors such as wind speed, currents, visibility, sea state, and air and seawater temperatures. Nordvik (2000) is a review of field testing with data and results from over 10 years of study in the development of the Transrec Oil Recovery System. This study demonstrates how the windows concept was utilized to refine the design of test prototypes to provide wider windows of opportunity. In doing so, the weather-window for mechanical recovery operation was increased from 1.5 to 3 m significant wave height.

The effectiveness of mechanical (i.e., booms, skimmers, oil-water separators, and sorbents) clean-up operations in the marine environment will vary depending on selection of skimming principles, oil properties, environmental conditions, response time, platforms, equipment used, drift, spreading, type of oil, level of training, education, organization and management of clean-up operations, and use of resources. The time window for mechanical technologies is not as sensitive to the changes in oil properties as it is for in-situ burning or use of dispersants and/or chemical agents.

- The effectiveness of mechanical clean-up can be separated into three main categories: the first is related to skimmer effectiveness only;
- The second is the system effectiveness that includes vessel, skimmer and boom; and

- The third is the operational mechanical effectiveness (OME), defined as the relationship between oil recovered and oil spilled.

Users of mechanical oil recovery systems during experimental spills over the past 10 years have reported system effectiveness data that typically range between 60–95% efficiency (vessel, boom and skimmer) and 65–95%, for operations in wind speeds up to 20–25 knots and significant wave heights up to 2.5 m (Nordvik, 1987).

Vital boom characteristics that affect wave conformance are:

- Flexibility of boom material;
- Stabilization weight;
- Distribution of longitudinal forces;
- Vertical and horizontal flexibility of the body; and
- Reserve buoyancy to weight ratio (B/W).

To optimize the operational capacity and effectiveness of skimmers, the skimmer and the boom need to be integrated into a system so as to increase oil thickness and maintain the flow of oil to the skimmer head. For effectiveness of oil-water separators, the windows-of-opportunity is defined by a series of factors, depending on skimming principles: changes in differential density between water and oil/emulsion, oil thickness, debris, viscosity of the oil and emulsion, water content and stability of the emulsion, interfacial tension between oil and water, level of turbulence within the skimmer, oil droplet sizes, the resident time of the oil inside the separation unit, and environmental conditions.

Users of mechanical oil recovery processes during experimental spills over the past 10 years have reported system effectiveness data (vessel, boom and skimmer) that typically are in the range between 60–95% in wind speeds less then 20–25 knots and significant wave heights below 2.5 m.

The practicality of operations are also limited by daylight hours and reduced visibility. Remote sensing technologies and use of a real-time downlink connection that provides a real image of the spill situation to the oil recovery vessels, will improve the effectiveness of an operation and extend the window-of-operations by providing vision, day, night and during periods of reduced visibility, for location of slick and thicker areas (Nordvik, 1990).

7.1.3.1. Booms

The window of opportunity where boom technologies are most effective have been found to be related to towing operations, environmental conditions, boom characteristics, and oil properties. For oil properties, water content and viscosity impact boom effectiveness (reduced oil loss rate from a towed boom) more severely. Vital characteristics of booms that affect wave conformance are flexibility of boom material, stabilization weight, distribution of longitudinal forces, vertical and horizontal flexi-

bility of the body, and reserve buoyancy to weight ratio (B/W). The flexible structure incorporated into the design of the Barrier Boom TM (Svendsen, 1994) is an example of these characteristics. Studies in the North Sea (NOFO, 1989) have found that as viscosity of emulsions reaches 1000 cP s-10 (increased water content), the net loss of pure oil from towed booms is reduced. Estimated time windows-of-opportunity for booms are presented in Table 7.3 for ANS and Bonnie Light emulsions.

Table 7.3

Estimated time windows-of-opportunity for minimum loss of oil from booms for ANS and Bonnie Light emulsions.

Oil	Time to reach 1000 cP @ S^{-10}	Time to reach max. water content	Least effective	Most effective
ANS	26 hr	120 hr	<26 hr	>120 hr
Bonnie Light	3 hr	6 hr	<3 hr	>6 hr

7.1.3.2. Skimmers

To optimize the operational capacity and effectiveness of skimmers, the skimmer and the boom need to be integrated into a system. This integration is necessary to maintain increased oil thickness and the flow of oil toward the skimmer head. The effectiveness is influenced by: changes in oil characteristics; choice of skimmer technology and engineering design; the use (including placement) of selected boom technology; environmental conditions; and the responder's operation of the equipment.

The window-of-opportunity for use of skimming equipment, related to changes in oil properties, is the widest among the three primary response methods. The window is dependent on the rate of evaporation, emulsification, the subsequent increase in the viscosity, and their effect on the various skimming principles such as disc, belt, brush, mop, drum, and weir. Table 7.4 presents the estimated time periods of the window-of-opportunity for use of disc and brush skimming principles, using viscosity data of BCF 17, BCF 24 crude oils over time. It is noted that for BCF 17 that the window-of-opportunity for maximum effectiveness for disk skimmers never opens because the viscosity of the fresh oil is above 2000 cP.

Table 7.4

Estimated windows-of-opportunity (most and least effective time periods) for two skimming principles. The windows are based upon the results of tank tests for skimmer capacity and effectiveness at different viscosities correlated to viscosity data from the IKU Oil Weathering Model.

	Disk	Skimmer	Brush	Skimmer
Oil	Most effective 200–1000 cP	Least effective 4000–10,000 cP	Most effective 400–1000 cP	Least effective 10,000 + cP
BCF 17	Not open	3–10 hours	0 hours	10+ hours
BCF 24	0–4 hours	2–3 days	1 hour	3+ days

7.1.3.3. Oil-Water Separators

The window-of-opportunity and the effectiveness of an oil-water separator will vary widely, from pure water to pure oil. It is defined by a series of factors: skimming principles; oil thickness; by debris; the difference between the density of the oil/emulsion and seawater; viscosity of the oil and emulsion; water content and stability of the emulsion; interfacial tension between oil and water; level of turbulence within the skimmer; oil droplet sizes; the resident time of the oil inside the separation unit; and environmental conditions (Nordvik et al., 1994).

Capacity will vary depending on the selected skimmer system. In general, separators perform better when skimmer capacity is low and the oil content in the oil water mixtures is less than 40–50%. A skimmer with an effectiveness higher than 40–50%, used in line with a separator (as a system), may cause a drop in the effectiveness of the separator. If the skimmer and separator are not well matched, it may result in more water being discharged through the oil effluent storage line (with water being added to stored oil) and therefore cause more frequent transportation and discharge operations, less time for skimming, extended time of a clean-up operation and higher clean-up and disposal costs. Separators utilizing the principle of differential density of fluids are particularly sensitive to the changes in the density of spilled oil. The increase in density is dependent on evaporation, emulsification and the salinity and the water content of the emulsion, which can reach a level of 70–90%.

The window-of-opportunity for oil-in-water separators can be estimated for example using a differential density of 0.025 g/ml between seawater and an oil emulsion. (See Table 7.5.)

Table 7.5

Window-of-opportunity for a selected centrifugal separation unit as related to density of emulsions. Data were developed from the IKU Oil Weathering Model.

Oil	Density seawater (g/ml)	Density emulsion (g/ml)	Time (hrs)	Viscosity (cP)
ANS	1.020	0.995	18	6000
Bonnie Light	1.020	0.995	24	8000

7.1.3.4. Sorbents

Sorbents are used as a mechanical method for cleaning up oil spills in the marine environment, by either absorption or adsorption. Adsorption capacity is a function of the amount of surface area upon which the oil can adhere and the oligophilic properties of the sorbent. Absorbents soak up oil like a sponge, and the capacity is more of a function of the porosity of the material. Viscosity, stickiness, stiffness, and adhesion properties of the oil are believed to be the most important factors that influence the effectiveness of sorbent materials. Sorbents were among the first oil spill

response technologies, from a rag being used to wipe up spilled oil, so historically this gives them the role of being a pioneer in the oil spill clean-up business. It also gives them the status of being a primitive or ancient not modern technology. This is a myth, because sorbents have been evolving since the early 70s and have become quite sophisticated. A problem for sorbents is the perception that all sorbents are pads. Sorbents are modern complex matrices that retain a liquid once exposed to the liquid. Dan Jones once described the problem that sorbents have is the Free Liquid Law, which is when a liquid that will separate from a solid under ambient pressure and temperature and therefore shall not be considered adsorbed.

The world of sorbents is made up of three categories of materials:

- Natural Sorbents (straw, peat moss, corn cobs, feathers, sawdust), they have low efficiency and maybe limited in what and how much oil you can absorb with them;
- Mineral Absorbents—clays, quarts and crystalline silica and you may have some OSHA problems with breathing fibers and/or they need to be contained in a sock; and
- Man-Made Engineered Absorbents (designer sorbents to do a specific job) may be expensive.

A problem that sorbents have is that their use can be labor and time consuming as an oil spill response technology. This is looked upon by the responder as an economic engine, for example, the responder gets paid a dollar to put out pads and then gets paid a dollar to pick them up and then a dollar to dispose of them, and the overhead that he makes from these hours may keep him in business next year when spill events occur elsewhere. The company paying for the large ocean oil spill wants a technology that may recover 20,000 gallons an hour, because it may be dealing with thousands of barrels of spilled oil.

Nevertheless, sorbents should not be overlooked and considered a primitive technology. In certain situations, they may be the most cost effective and best response. In the future, significant advances are in store, which may significantly increase the use of sorbents because they will be used as multiple use technologies, perhaps in absorbent (for wicking) and in-situ burning booms.

Effective use of sorbents is limited in time and governed by changes in oil properties. The most efficient, environmentally preferred, and cost effective spill response is dependant on the following factors: chemistry of the spilled product, quantity, location, response time, environmental conditions, and effectiveness of available response technologies (given the first five factors).

An increase in oil and emulsion density over time will significantly reduce the buoyancy difference between the spilled product and the seawater and subsequently reduce the buoyancy of sorbents. The progressive changes in density, resulting from evaporation and emulsification oil and emulsion viscosity interfere with sorbent effectiveness. Most fresh crude oils and refined products have specific gravities between

0.80 and 0.98 g/cm^3. The density will increase with evaporation and emulsification and potentially bring the density above 1. Sinking of oily sorbents with high density close to 1 is therefore likely.

A discussion of terms and definitions related to sorbent use in oil spill response is necessary. A sorbent is a material that recovers oil through either absorption or adsorption and can further be classified as reusable or non-reusable. Sorbents are defined as cleaning agents or treating agents and the oil sorbent materials generally fall into three major classes: mineral products, vegetable products and synthetic products. Mineral products include: perlite, talc, vermiculite, clay, volcanic ash, fly ash, and others.

The adsorption capacity is a function of the amount of surface area upon which the oil can adhere.

- **Adsorbents** are defined as materials in which the sorbent process is the external physical coating of a sorbent with oil and not incorporation into the material.
- **Absorbents** soak up oil, and the capacity is a function of the porosity of the material. Absorbents are defined as materials, which the sorbent process is to incorporate the oil internally into the material.

To optimize the cost effectiveness of a sorbent clean-up operation, materials that have unusually low densities, pickup ratios in terms of volume rather than weight should be considered.

The window-of-opportunity for an absorbent can be estimated from viscosity data from the IKU Oil Weathering Model. It should be noted that the viscosity limitation for effective use of sorbent is approximately 15,000 cP (Newtonian behavior) In Table 7.7, the window-of-opportunity is estimated for one type of sorbent (polyamine flakes) for two fresh oils. The two fresh oils, have the following respective viscosities 180 cP (BCF 17) and 2,000 cP (BCF 24), when spilled. For example, 50% of the sorbent's capacity will have been achieved in 36 hours with BCF 24. In 240 hours, BCF 24 will have reached a viscosity of 15,000 cP, at this viscosity, the sorbent materials will have zero capacity to adsorb this oil (see Table 7.6).

Table 7.6

The estimated window-of-opportunity for the absorbent polyamine flakes from viscosity performance data combined with viscosity data from the IKU Oil Weathering Model.

Oil	Synthetic sorbent (polyamine flakes)			
	Viscosity range (cP)	Time to reach 15,000 cP viscosity	Time to reach 50% saturation	Max. capacity saturated g oil/g sorb.
BCF 24	180–15,000	240 hr	36 hr	54 (180 cP)
BCF 17	2000–15,000	96 hr	12 hr	40 (2000 cP)

7.2. Universality of Application

The application of windows as a scientific and engineering planning and decision-making tool for marine oil spill *contingency planning*, *education*, *training*, and *response*, is not difficult but specific data are required as discussed in the above sections. It requires integration of performance effectiveness data for oil spill response technologies derived from laboratory, mesoscale, and experimental field studies, with real-time environmental data. The performance effectiveness data must be correlated to a wide range of viscosities of different weathering stages of tanker transported oils into a dynamic oil weathering database. This will allow for one to identify and estimate time periods that are the windows of opportunity of maximum effectiveness for a given technology, depending on environmental conditions and the degree of weathering. In these windows, specific response methods, technologies, equipment, or products are more effective during clean-up operations for specific oils. The major contribution of the "windows" concept is to create significant environmental and cost benefits in oil spill response.

7.2.1. Future Data and Information Needs for Application

- Identify and characterize oils transported.
- Determine physical, chemical, and weathering properties for major oils transported.
- Create an oil database for general physical and chemical properties.
- Create an oil weathering database for physical and chemical properties of oils.
- Create a database for effectiveness of available oil spill response technologies stockpiled under normal range of environmental conditions.
- Develop estimated technology windows-of-opportunity for predominate oils transported under a normal range of environmental conditions (waves, winds, and for coastal and near shore seawater temperatures) from the IKU model.
- Integrate real-time tabs data into dynamic database for IKU model.
- Create a certification protocol for oil weathering data and technology effectiveness data, and develop an at sea visible—color code for calibrated and verified effectiveness of technologies (i.e., a red color means seastate 3 mm certified).

7.2.2. System Output

Application of the above databases will produce these results:

- Generic oil spill response advisories (from chemical and physical data);
- Estimated technology windows-of-opportunity for oils transported in coastal waters from general physical and chemical properties database;
- Specific oil spill response advisory (from weathered predominate oils);

- Estimated technology windows of opportunity for oils transported in coastal waters (from weathered oils);
- Dynamic databases for oil, physical and chemical and weathering properties;
- Certification protocols for effectiveness of technologies;
- Review marine coastal contingency plans; and
- Windows-based education and training curriculum/program.

7.2.3. Oil Spill Contingency Planning and Response

Oil spill contingency planning and response is an extremely complex and challenging cross—disciplinary experience. In the operational decision-making system, it combines a wide range of issues and activities under emergency response conditions that include: the nature of the material spilled, which undergoes changes in physical and chemical properties (weathering) over time, local environmental conditions, sensitivity of impacted natural resources, and selection and effectiveness of response/clean-up technologies. This also encompasses emergency mobilization, marine operations and effectiveness of operations, air surveillance, remote sensing, on site and regional spill trajectory, human protection, safety assessments, oily waste minimization, handling and disposal, and education and training. Effective oil spill planning and response today requires a large amount of available data and information and the ability to rapidly process and manage this information. The technology windows-of-opportunity concept is very compatible to extensive data and information requirements. In Japan, several groups have been developing very advanced integrating data and information systems (Matsumoto, 1991; Tsukihara, 1995; Miyazoe and Hashizume, 1995), but these systems are not based on weathering of oil. It would NOT be very difficult to add windows strategy to these systems.

Planning and decision making in oil spill response requires an understanding of oil weathering processes and subsequent changes in an oils characteristics and the effect of these changes on response technologies over time. These changes have an important influence on the usefulness and effectiveness of response methods and technologies. Three major categories of response (clean-up) methods are available: (1) mechanical recovery; (2) chemical treatment; and (3) in-situ burning. Methods and technologies in each of these categories are limited by environmental conditions both operationally and as a result of the changes in oil characteristics over time. Dynamic oil weathering models have been developed to predict changes in oil properties over time and have been used as a decision-making tool in actual spill and spill scenario over the past several years in particular to assess use of dispersants (Reed and Nordvik, 1993; Reed et al., 1999; Reed, 2000). The integrated windows concept has linked changes in specific oil characteristics (weathering over time) to environmental conditions, and the effectiveness of technologies under those given conditions as a method to improve decision-making capabilities in oil spill planning, response, education and training.

Effective use of dispersants, in-situ-burning and some mechanical technologies is limited in time and governed by changes in oil properties. The most efficient, environmentally preferred, and cost effective spill response is dependant on the following factors:

- Chemistry of the spilled product;
- Quantity;
- location;
- Response time;
- Environmental conditions; and
- Effectiveness of available response technologies (given the first five factors).

Utilization of multiple response technologies requires a rapid and scientifically-based decision-making tool and an integrated system of response capabilities.

In the US, the technology windows-of-opportunity concept has the potential to require significant changes in the OPA 90 Area Contingency Plan (ACP) requirements, the National Contingency Plan (NCP), the Coast Guard Navigation Safety Regulations 33 CFR 160—Advance Notice of Arrival, and the OPA 90, and Vessel Plan (VRP) requirements. Under these requirements, It is quite possible that vessel owners will have to demonstrate that they have sufficient resources to respond to a spill geared to the characteristics and weathering properties of oil the vessel is transporting, ambient environmental conditions, effectiveness of available technologies, and its trackline. Vessel owners may be required to provide this information at least 24 hours prior to arrival. The qualified individual, QI, would be required to demonstrate he/she is aware of this information. (See Sections 2.3, 2.4, 2.5 and 2.6 of this book.)

It will be critical in future contingency planning, that a spill response plan be developed for a suite of oils transported in coastal waters, and maximize the cost benefits from the purchase and storage of the most effective appropriate equipment and technologies at sites close to the shipping lanes of specific oils.

It is expected that in the near future, that the Area Committee would be required to study all oil types transported in a region and develop worse case scenarios geared to each oil type and incorporate this information into the Area Contingency Plan. The NCP would require incorporation of this more detailed information by the Area Committees and vessel and facility owners. The concept of cascading equipment for response would need to be closely reexamined so that the right equipment and technologies were being employed at the right time. The Pollution Response Exercise Program (PREP) would also have to be geared to this higher level of knowledge. Failure to account for the employment of the most effective—optimal technologies as a function of oil type and weathering (time) by the On-Scene Coordinator (OSC) and state officials, could place the federal and state governments at risk of lawsuit for negligent management, from the environmental community, vessel owners and insurers.

7.2.4. Education and Training Tool

Education and training programs are needed for all parties involved in oil spill response, which would cover:

- The basic science and engineering knowledge involved in the windows concept;
- The science and engineering knowledge involved in the design and development of equipment and technologies;
- An understanding of the changes in oil properties, physical and chemical processes involved; and
- The effects of changes in oil properties on spill response and technologies.

Specific training programs should be developed to maximize the experience and capability to utilize the windows concept on a local or regional basis. For example, for coastal waters, spill response contingency plans, equipment and technology, and training programs could be tailor made for the dominant oils that are transported to refineries providing a greater degree of protection, a faster and more effective spill response, minimize environmental impacts, all at significant cost savings. Basically the windows approach eliminates the need for the security and expense of the shotgun approach (which covers all bases) and replaces intuition with science in the spill response decision-making system.

In addition, and equally as important, this system allows for all management personal to communicate the critical scientific, engineering and reasoning aspects that underlie the decision-making system to everyone involved (from operations to the public and private sectors), which in turn can be evaluated on an equal basis by all parties. (See Section 2.3 of this book.)

7.3. Required Databases

The following data and information needs have been identified as required databases to better define the capabilities and estimate the technology windows-of-opportunity for spill contingency planning and response for Coastal Waters (Nordvik, 1995):

- Dynamic databases for oil, physical and chemical and weathering properties.
- Certification protocols for effectiveness of Technologies.
- Estimated Technology Windows Of Opportunity For Oils Transported in marine coastal waters (from weathered oils).
- Reviewed marine coastal contingency plans.
- Windows-based education and training curriculum/programs.

7.3.1. Transported Oils Database

- Identification and characterization of oils transported in coastal waters.
- Creation of a database of the actual fresh crude oils as well as refined oil products shipped in coastal waters for physical and chemical properties.

- Implementation of the IKU oil weathering testing methodologies for actual fresh crude oils as well as refined oil products shipped in coastal waters as an international standard method for laboratory oil weathering studies.

7.3.2. Technology Effectiveness Database

- Creation of a database for effectiveness of available oil spill response technologies for emulsified oils: dispersants, sorbents, and skimmers in both calm seas and high sea states.
- The creation of a database of for effectiveness of different technologies stockpiled (available) in the coastal waters
- The linkage of a dynamic oil weathering model to a dynamic performance technology database for oils shipped in costal waters to enhance the identification and quantification by responders of the technology windows-of-opportunity for selected methodologies and associated equipment.
- Further investigations are required in order to study the effect of emulsified oils, skimmer design, and wave actions on the window-of-opportunity. Data are needed for improvement of skimmer technologies, for establishment of data to meet existing and new capacity requirements, and for new designs of skimmers for vessels of opportunity.
- Create a certification protocol for oil weathering data and technology effectiveness data, and develop an at sea visible—color coded for calibrated and verified effectiveness of technologies.

7.3.3. Development of an Oil Weathering Database

- Determine the weathering properties for major oils transported.
- Create an oil database for general physical and chemical properties.
- Create an oil weathering database for physical and chemical properties of oils
- Develop estimated technology windows-of-opportunity for predominate oils transported under a normal range of environmental conditions (waves, winds, and for coastal waters temperatures) from the IKU model.
- Integrate real-time tabs data into dynamic database for IKU model.

7.3.4. Development of a Tides and Currents Database

- Collect tidal and current historical data for coastal waters
- Create a tidal and current historical database for coastal waters.
- Link historical database to real-time data from offshore oceanographic automated buoys.
- Develop an offshore oceanographic buoy system with current meters to cover the physical real-time data needs of the Windows System.

7.3.5. Development of the Technology Windows-of-Opportunity Database for Oils Transported in Coastal Waters

- Generic Oil Spill Response Advisories (from chemical and physical data).
- Estimated Technology Windows-of-Opportunity for oils transported in Coastal Waters from general physical and chemical properties database.
- Specific Oil Spill Response Advisory (from weathered predominate oils).
- Estimated Technology Windows-of-Opportunity for Oils Transported in Coastal Waters (from weathered oils).

7.3.6. Review of Oil Spill Contingency Plans in Accordance with Estimated Technology Windows

- Generic oil spill response advisories (from chemical and physical data).
- Estimated technology windows-of-opportunity for oils transported in coastal waters from general physical and chemical properties database.
- Specific oil spill response advisory (from weathered predominate oils).

7.4. Oil Spill Detection and Monitoring by Remote Sensing Advanced Technologies

Satellite imagery with selected sensors can be extremely valuable for detecting and monitoring the natural (seeps) and man-made discharge (ballast waster from ship or oil spills) occurrences of oil on the sea surface. Large-scale coverage that satellites provide can serve as an early warning system to detect and verify oil spills. A satellite placed in the proper orbit could provide nearly hourly coverage of high-risk coastal waters. Automated algorithms could automatically search the imagery for abnormal conditions locating spills or illegal discharges or dumps, serving as a coastal policing role.

The use of aerial surveillance to aid clean-up response efforts can mitigate the impact of the oil spilled as well as reduce clean-up costs (Lambert et al., 1992). Oil spilled or dumped at sea by ships can be monitored by satellites. Under favorable weather conditions, it is possible to acquire satellite observations and monitor oil slick movement occurring from natural or manmade sources (Bern et al., 1979). Oil spilled from the *IXTOC-1* Well blowout in the Gulf of Mexico (June–August 1979) was detected in images from satellite sensors such as MSS, AVHRR and CZCS (Alvarado, 1980). Also the *Kuwait Oil Spill* (Arabian Gulf, 1991) was tracked by satellite data. These were large spills in which oil was spilled continuously over a several month period. Satellites can be used for large and persistent oil spills because of their low spatial resolution (10 $\times$ 10 m pixel), untimely coverage and long post-processing delays.



The 1991 Gulf War produced what is estimated as the world's largest oil spill (c. 6–8 million barrels of crude oil), it was a deliberate act of war. A special issue of the *Marine Pollution Bulletin* was published in 1993 dedicated to summarize the environmental studies of the Gulf following the War (Price and Robinson, Guest Editors) Volume 27: 1–376. Photographs courtesy of NOAA Office of Response and Restoration.

Most oil spills today are smaller and occur over relatively short periods of time in near coastal waters and are relatively instantaneous dynamic events requiring quick response and decisive action to reduce impacts and costs. However, for these spills, the same sensors and systems can be utilized from low altitude aircraft to obtain spatial, distribution, and volume data about spills and for tracking spills. During and following a spill, response management needs specific data and information about

the oil and its trajectory to determine priority in protecting environmental resources and to maximize the utilization of selected technologies to isolate or to separate and recover (clean-up) oil at sea rather than on land which has significantly higher total costs and environmental impacts.

Remote sensing is an increasingly important part of oil spill response and countermeasures. The public at large expects that the government and the spiller at least know the location or trajectory and the extent of the contamination. Remote sensing can help provide data and information to the legal process that will validate the extent of contamination. Clean-up personnel have also recognized that remote sensing can increase the efficiency of the spill clean-up and reduce costs by 20–30% because crews can work night and day using IR direct downlink to response ships from helicopters to locate oil at night.

Furthermore, recent advances in electronics and sensors have made instrumentation much cheaper and more effective. Despite this, the actual operational use of remote sensing worldwide lags behind the technology of sensor design. Much of this is due to a lack of a centralized response management capability rather than local authorities who may be responsible for the clean-up and lack awareness and training in remote sensing. Extensive capabilities for remote sensing as an oil spill management tool have been developed in the US, Canada, UK, Sweden and Norway.

Remote sensing technologies can provide oil spill response management with data and information for the following users:

- Response management;
- Policy and decision makers;
- Government information and documentation needs;
- Regulatory actions;
- Resource damage assessment;
- Impacts on mariculture/fisheries;
- Impact on recreation;
- Spill liability; and
- Insurance adjustments.

Several Variable Remote Sensing Systems are available on the market that integrate a series of sensors into a system that allows operators to enhance, integrate imagery and to maximize the data and information available to oil spill response management. The use of low altitude aircraft have proven to be the most cost effective and tactical method for obtaining information about oil spills. Combined with accurate oil drift computer model forecasting, these two methods were the primary strategic tools used for environmental response planning during the IXTOC-1 and Arabian Gulf spills. These systems can provide real-time displays to response management and to recovery vessels, images can be enhanced to allow extensive image analysis.

Research is needed to detect and link at sea (In-situ) weathering—emulsification of the specific spilled oil to an irradiant energy spectrum to increase the precision

and timing of technology windows-of-opportunity. This would maximize the use of windows as a decision-making tool in oil spill response.

7.5. Integration of Databases and Information into an Oil Spill Response Decision-Making Tool

Oil spill response management in the past decade has evolved advanced remote and mobile systems to collect data and information and to transmit it directly from the spill to response policy and decision makers. Advances have been made in developing a series of new tools for contingency planning, response and training. These new scientifically-based tools can collect data from multiple sources, to bring together the impact of weather, sea state, wind, current and water temperature, the physical and chemical properties and characteristics and trajectory of the spill oil for identification of the time periods that specific response methods and technologies are most effective.

There is a need to develop an integrated oil spill response management advisory system that can:

- Integrate satellite and airborne remote sensing data with GIS mapping of coastal and environmentally sensitive areas and resources to identify and monitor the presence and transport of spilled oil and to direct response (clean-up) operations in real time (24 hours/day in bad weather or darkness).
- Model current, tidal and wind data to model oil transport and predict trajectory patterns for spilled oil, which can predict in advance where the oil might come ashore, allowing for greater efficiency in clean-up and protection of natural resources.
- Integrate the following data: weathering of oil; physical oceanography data (wind speed and direction, currents, water temperature and salinity); technology and equipment efficiency data for a range of environmental condition; and operations data to estimate the "Windows-of-Opportunity" for available spill response technologies.
- Integrate operations data from many different sources; and local and regional scenarios to provide response management with recommendations that can support contingency planning, training, and oil spill response management.
- The Advisory System needs to be able to integrate real-time data from advanced remote sensing systems, oceanographic physical data, with databases for weathering of different oils transported in coastal waters with databases for technology effectiveness to delineate Technology Windows-of-Opportunity to provide Best Response. (See Sections 2.2, 2.3 and 2.4, of this book.) Figure 7.6 presents an overview of the components of the Advisory System. Its value is that the system provides for an integrated cost effective and scientifically-based response.

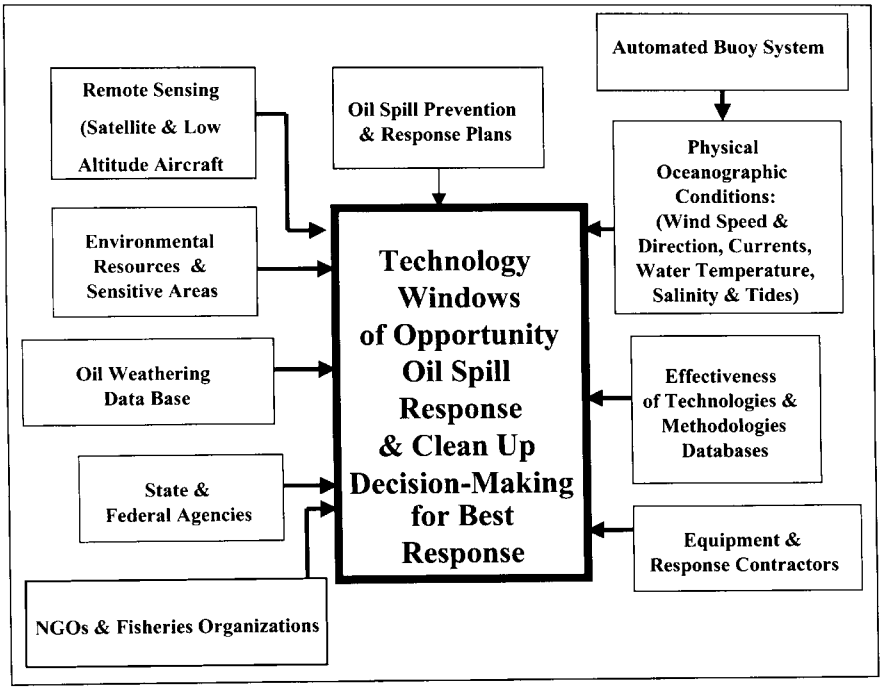


Fig. 7.6 An illustration of the technology windows-of-opportunity oil spill response management decision-making system. The system integrates real-time data from advanced remote sensing systems, oceanographic physical data, weathering of oil databases, available equipment databases with databases for technology effectiveness to delineate technology windows-of-opportunity to provide best response.

Utilization of multiple response technologies requires a rapid and scientifically-based decision-making tool and an integrated system of response capabilities. Rapid oil spill response decisions are of vital importance to mitigate and reduce environmental damage (see Sections 3.1 and 3.2 of this book). Remote sensing data have become an important factor in the decision-making process in order to determine the extent of the spill (satellite images) and level of response needed and for operational direction of resources (aircraft images) in clean-up. For dispersant and in-situ burning, decisions needs to be made immediately in order to respond within the first 2–24 hours after a marine oil spill has occurred.

Major oil spill incidents over the past decade have led to development of more specific and stringent requirements and regulations in many countries around the world, followed by establishment of response organizations using clean-up methods, ruled by governmental policies and environmental concerns. Response methods are therefore quite varied among the countries around the world, even for the same spill of oil. The ability of a spill responder to use the most effective or multiple response methods in dealing with oil spills has been quite limited.

Ideal marine oil spill response strategy and tactics should focus on the use of the most rapid, efficient and cost effective response methods and technologies including "no-action" except perhaps monitoring if the spill is well offshore and has limited environmental impact. Use of the most effective response method and technologies requires access to reliable, national and international accepted data, based upon a scientific and engineering approach. The windows-of-opportunity concept with the combined information from dynamic oil weathering model and performance technology databases can become a decision-making tool identifying and defining the window of effectiveness of different response technologies (methods and equipment) under given environmental conditions. The total costs (including environmental, social and economic) from most oil spills could be greatly reduced if such a system were available today. Most important, the response actions would be scientifically based, cost effective and stand up in the courts as indeed the Best Response.

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Chapter 8

Sustainable Shipping

Today, the shipping industry is faced with one of its greatest challenges. Will its players embrace the "safety culture" and protect not only the bottom line, but also safeguard the environmental health of the oceans and rivers upon which oil is transported? In other words, will the shipping of oil become sustainable? In the answer to this question lies the future viability of shipping.

Industry has the tools and the knowledge needed to affect good stewardship: to prevent costly accidents and to activate "best response", reducing environmental impact if spills happen. The policy considerations for environmental stewardship have been identified clearly:

- Adoption of the safety culture in all aspects, including proactive safety management,
- Long-term contingency/vessel response planning,
- Creation of a quality system with responsibility and accountability for each link in the chain,
- Training of qualified mariners who can perform their jobs,
- Use of best technology and science in response, and
- Restoration endpoints considered from the beginning in clean-up decisions.

These new policy goals should replace current, short-term thinking of "business as usual" profit maximization and crisis reaction.

Sustainable development has been defined in many ways. The most comprehensive statement was made by the United Nations in 1987: "Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs". Two other definitions contribute to shaping an understanding of a sustainable "safety culture". In order to frame this new culture, there must be a balance between economic and environmental sustainability: "Sustainability in the economic sense means the efficient allocation of scarce goods and resources. Sustainability in the environmental sense means not exceeding the limits of environmental impact and maintaining the natural basis of life" (Ullring, 1996a).

Even in the act of defining sustainability, two competing paradigms emerge. One is the anthropocentric, human-centered approach. The other is the ecosystemic view. These are comparable to the warring cultures in the shipping industry, "the evasion

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and compliance culture" as opposed to the "safety culture". The human oriented view is that sustainability is achieved so long as the total stock of resource capital is preserved for future generations. There are no irreplaceable resources, and capital, labor and natural resources are all interchangeable. The value of resources is in how they function for the benefit of humans (Norton, 1995).

The opposing approach views natural elements as being irreplaceable resources, constituting "natural capital". The job for today is to pass onto future generations a world with clearly defined constraints on alteration of these physical and ecological elements, which have value independent of human welfare (Norton, 1995). The synthesis of these competing viewpoints is what drives good resource management. More is required than just a "sustained flow of goods". Sustainable management "... must take care to ensure the continued function of natural processes and the integrity of natural systems. For it is upon these, ultimately, that human resources and human well-being depend" (Callicott, 1992).

The European Communities' "Maritime Industry Charter on Quality" defines sustainability in concrete terms for the shipping industry. The goal of this charter is to create a quality culture throughout the industry as a whole and to implement the international regulatory standards so as to provide shipping services, "... of high technical, safety and environmental quality", a business climate that protects people, the environment, ships, and fair competition (EC, 1999). The Center for Maritime Leadership applies the term "Ideal Maritime Vision", to this new concept of sustainable shipping: "Pristine, renewing oceans, lakes and rivers that produce abundant life for humanity and nature... Water everywhere that is a continuous and sustainable resource that provides livelihood, enjoyment, nourishment, inspiration, healthful living, and peace for our children and their children after them" (CML, 1998). The challenge of becoming a total "safety culture" cannot be met by using past solutions to solve past problems, which exist today. New thinking is needed is to solve the old problems.

Once regulations for the tanker industry are well-settled and implemented, the next area of attention for IMO and the US is that of bulk carriers. These vessels carry other cargo primarily and use bunker fuel to power their ships, as opposed to oil tankers that are devoted to transporting oil (ITOPF, 1998). ITOPF, for example, has defined a tanker to mean "any ship (whether or not self-propelled) designed, constructed or adapted for the carriage by water in bulk of crude petroleum, hydrocarbon products and any other liquid substance". So significant is trade by non-tankers and potential spill problems, that as of February 1999, ITOPF established an "Associate Status" for non-tanker owners or demise charterers (ITOPF, 1999). ITOPF estimated response to oil spills of non-tankers for the last 15 years. 28% of all spills attended by ITOPF over the past 15 years have been for non-tankers, with that percentage increasing to 38% during the last 5 years, and as high as 50% during 1999 (ITOPF, 1999a).

The increased incidence of spills from these vessels stresses the importance of establishing the safety culture in the tanker oil industry, so that the same elements and framework can be applied to other vessels. Passenger ships are not excluded from

significant pollution concerns, as for example, the most recent pollution activity of the Royal Caribbean Cruise Lines and one of their latest fines of $18 million for dumping oil and toxics into US waters. Sustainability of shipping will require addressing oil spills, their prevention and response, from all types of vessels. In response to the increasing number of bunker spills, IMO proposed a diplomatic conference to adopt an international convention for liability and compensation for damage by oil from ships' bunkers. This convention establishes a regime for oil carried as fuel, which would be similar to that existing for tankers under the International Convention on Civil Liability for Oil Pollution Damage, 1969. (IMO, 1999). At its 81st Session, the Legal Committee of IMO completed consideration of a draft international convention on bunker oil pollution and agreed that the draft convention be forwarded to diplomatic conference for adoption. The Committee proposed that the conference by held in the first half of 2001 (IMO, 2000a).

Sustainable activities follow certain long-term rules:

- "Renewable resources: consumption does not exceed production.
- Non-renewable resources: consumption does not exceed production of a renewable substitute (e.g., a part of the income from oil production is invested in developing alternative energy sources to maintain the level of energy supply the day the wells are empty).
- Pollution: emissions do not exceed nature's ability to recirculate, absorb or render harmless..." (Ullring, 1996a).

The importance of the third factor, "pollution", cannot be underestimated when considering the future of oil transport. Scientists in the US and international communities debate basic scientific policies: the ability of the environment to handle oil pollution, whether natural recovery will restore the resource to pre-spill condition, what pre-spill condition is given natural fluctuations, how much clean-up should be used, whether response and human intervention may be more harmful in some instances than natural recovery, and the need for or the type of restoration/reinstatement of the environment to be undertaken. [See discussion, Sections 1.3, 2.6, 3.2 of this book.]

Even in the face of strong differences of opinion, most responders agree that oil from ships can have substantial negative impacts on natural resources (GESAMP, 1993) and that it is better to be prepared than to conduct "management by disaster", dictated by public perception. There is concurrence that long-term contingency planning is best. Responders recognize that more research is needed to develop scientifically based response techniques, and that "best response" means using the proper tools from the tool box at the right time in the right place. Systems like "Technology Windows-of-Opportunity" can deliver the response arsenal.

However, tools are only as good as the people who wield them. Another positive shift, focus on the human element, has occurred in all levels of the shipping business. But, this reorientation needs constant refinement. Open policy questions must be answered so that the worldwide trend of reductions in accidents continues. The

human factor has become a crucial element of sustainability. Conventions, laws and regulations are in place and establish a framework for the safety culture: MARPOL 73/78, SOLAS and its ISM Code, STCW '95, the Paris MOU and other Port State Control agreements, OPRC, the Bonn Agreement and others, Intervention on the High Seas, and OPA 90. This body of law requires a high level of safety management throughout the business of shipping oil. The US Coast Guard Prevention Through People program and the international incorporation of the concept of partnership between industry and regulators is changing the face of how businesses conduct their activities.

Self-motivation, self-instigated audits, self-improvement, communication between different facets of the industry produce results, focus more on the human element, and lead to truer prevention and safety. Regulation establishes the minimum safety conditions. Self-regulation produces the optimum area of safety and effective management. Best Response involves all stakeholders in the process of protecting the environment and choosing the optimum path to recovery of natural resources. Sustainability results from all parts of the safety net working together to meet the challenge. William O'Neil, in his World Maritime Day 2000 address, stressed the "universal culture of safety" and the importance of each element of the "safety net" that "underpins the safety of international shipping":

> "Shipping is a modern, international and multifaceted industry that eventually touches just about everyone on the planet. And there is not a single individual or group involved with shipping that stands alone, outside the network of partnerships. It is fundamental that we all commit to a process of continually re-examining the standards that we have established and the mechanisms we have created for ensuring their proper, uniform implementation" (IMO, 2000b).

Just as the positive aspects of a legal framework exist, so too are the motivators present to foster the safety culture. These incentives are often like the proverbial double edged sword, positive and negative. While there are differences in compensation regimes, application of liability and limitations on defences, the "polluter pays" concept is a given worldwide. Civil penalties, environmental criminal actions, public perception, demands for responsible actions and punishment of irresponsible spillers are the factors which are shaping the future of shipping. All links in the safety net are geared toward driving substandard operators out of the business or causing reform of their practices so that all ship owners/operators conduct their business on a level playing field:

- International Maritime Organization ISM Code Certification regulation.
- The US "zero tolerance" policy to those ships without such certification.
- STCW Code and the "white list".
- Industry refusal to allow membership, or support ships unwilling to convert to higher standards and appropriate safety models.

- Flag State Administration action on Classification society recommendations such that companies cannot trade.
- Classification society recommendations of removal of Safety Management Certificates and withdrawal of Documents of Compliance.
- Contract clauses in P&I Club rules and insurance syndicate rules limiting/denying coverage without proper certification.
- Blanket unwillingness of insurers to provide hull, equipment, salvage, pollution policies to substandard ships.
- Increasing Port State Control, inspections, detentions.

What these diverse drivers represent is a realization that the environment is "... not a 'free good' or 'externality', but an asset like human capital and capital goods. ... Moreover, there is a growing integration of ecology and economy" (Ullring, 1996a). Safety is good for business (Card, 1996). Integrating this basic concept of true cost accounting into the industry requires redefining the criteria for sustainable shipping. The new concept must be environmentally and therefore, economically feasible.

The model is far from complete. To create it poses a set of challenges. One of the most important is to level the playing field so that the "good" companies have a competitive edge and the "bad" players face environmental/economic penalties. The best operators, including major oil companies, must choose charterers of the highest quality so that oil travels first class, based on the sophisticated vetting procedures already in place. Regulators must implement the legal framework. Enforcers must eliminate substandard operators by civil and criminal fines and penalties. In the long run, economic incentives, in the form of the market, of repeat clientele, strong customer base, public stock support, a strong bottom line picture, will be the most vigorous forces for a proactive, safety-oriented approach to shipping (Ullring, 1997). Public acceptance of shipping as environmentally friendly requires not only good public relations, but also actual, measurable environmental performance by industry. The standards for measurement now exist. Education of the public sector is yet another millennium challenge. Double-hulled vessels by the year 2015 under OPA 90 and international standards, (or sooner, if proposals for amending 13FG of Annex I of MARPOL 73/78 are recommended by the Marine Environment Division of IMO) (IMO, 2000b), the Green Ships Programme of Det Norske Veritas, and the proposed "Ecoship" of the future all represent positive moves to produce a safety oriented, measurable and environmentally friendly product (Ullring, 1996a).

DNV designates these three challenges as being crucial to the outcome of this next millennium's sustainable shipping culture:

- "To continuously improve and document the environmental performance.
- To move from compliance to self-motivated improvement.
- To create incentives encouraging environmental excellence" (Ullring, 1997).

To these we must add two more:

- To use the best technology available: computerized modeling tools to establish safety management systems, simulated alternative safety measures, good data to determine causes for accidents and near misses, quantifiable behavior models for human error, determination of the fate and effect of oil and what tools should be used and when to combat the spill, with restoration being the primary concept (Ullring, 1996b).
- To improve the public's perception and response to the shipping industry. Some members of the public regard ship owners/operators with almost the same dislike they show toward Mafia "hit" men (du Moulin, personal interview, 1999).

Many industry leaders believe in the safety culture, fight for a change in industry preconceptions and working models, and affirm the tacit agreement that substandard ships must go. The shift in attitude from an "avoidance and compliance culture" to a "safety culture" is regarded by ABS, the third largest classification society in the world, as a primary goal for the future of the shipping industry:

> "Industry must make the decision whether to continue being overregulated (shipping being the most regulated industry in the world) or to be mature and become self-regulated. Each company must look on an individual basis at its problems and deal with them. The ISM Code requires more than just paper compliance. To comply with the code, the ship owner/company must use the code for its intended purpose, as a guide for good management, and create real, workable safety management systems throughout all facets of the company. No longer can a shipping company look at its ships in isolation. Failure of one ship to comply with ISM certification requirements may place the whole company in jeopardy .... The sphere in which bad ships can continue to trade is getting smaller, as such ships are being excluded from increasing numbers of regions worldwide" (Pearson, personal interview, 1999).

All members involved in the shipping industry safety net are making a difference and creating the safety culture according to John Ostergaard, Senior Advisor for the Marine Environment Division of the International Maritime Organization:

> "The ISM Code is bringing substandard ships up to better operating standards, in some instances, just because the company establishes someone who has overall, operational responsibility for what is going on and because the company must review all its safety procedures to properly document them. Port States have access to IAC's database to see who's been detained for non-compliance or non-conformity with the code. There is now more international cooperation between Port States, with Memoranda of Understanding covering most of the world. The STCW 95 gives IMO, for the first time, some real teeth, to see if a company has in place the training and procedures to ensure that mariners are properly trained to perform their jobs at sea. For countries like the Philippines, which is the biggest provider of seafarers to other countries, not being placed on the

> "White List" would be an economic catastrophe. Their focus is now on upgrading their maritime educational system, with help from countries like Norway" (Ostergaard, personal interview, 1999).

Insurers and P&I Clubs can impact significantly the old way of doing business:

> David Martowski of Thomas Miller (Americas) Inc, which represents the UK P&I Club in the Americas states: "It is clearly in the interests of P&I Clubs and their members who share risks on a mutual basis, to ensure that ships, systems and people comply with international safety regimes. The real politic is that ocean going vessels are not permitted to enter the worlds' major ports without P&I coverage. This provides a very efficient screening mechanism. Responsible ship owners and operators are very concerned by environmental risks and well aware of the aggressive standards taken by US and other major Port States. Substandard ships, as a rule, are not trading to these countries and the few that do, are detained, their deficiencies noted and reported, and if allowed to proceed, rarely ever return. This most conservative, traditional and misunderstood industry has undergone dramatic change. It remains to be seen how long it will take for substandard ships to be driven from the seas" (Martowski, personal communication, 1999).

Richard Hobbie, President of WQIS, one of the largest American shipping industry insurers, echoes these sentiments:

> "The insurance industry, by reducing rates, doesn't make meaningful impacts because, for good operators, we are already operating at reduced rate premiums. But, for the bad operators, people not in compliance with safety management regulations and other regulations, they will either have significantly higher premiums or won't be able to find insurance at any cost. These people will eventually go out of business or suffer uncovered losses" (Hobbie, personal interview, 1999).

Richard du Moulin, CEO for Marine Transport Corporation and former Chairman of the Board of INTERTANKO believes that enforcement of the safety culture is the biggest challenge for future of the industry:

> "There are three types of cultures in shipping. One is the old culture, those who view regulations as something that must be met, but not exceeded. The other is the substandard operator who will barely meet regulations, and if possible will shave a corner. This group is growing smaller. The third are the operators who really care about the marine environment and will exceed standards. To reach the safety culture, what is needed is not so much the development of adequate standards. Those now exist. What we need is enforcement by industry and third parties. Port States have taken on this job. We as industry need to look at them

> as our greatest ally and help them to rid us of substandard shippers" (du Moulin, personal interview, 1999).

Captain Gilmour, former Director of Field Activities for the US Coast Guard (now Chief of Staff of the USCG 13th District), best states the obvious:

> "I think the folks who want to be here 10 or 15 years from now are saying, 'this safety culture is going to happen" (Gilmour, personal interview, 1998).

The next decades will shape the viability of the shipping industry, for tankers and other vessels using and/or transporting oil. The road of the "safety culture" is clearly defined. Many in industry have set foot firmly upon that road. Others have not. Sustainable shipping can only become a reality if the great weight of the majority takes up this journey, moving those who will not embrace the new culture into smaller and smaller byways.

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Appendix I

Selected International Conventions

International Safety Management Code (ISM Code)—Ch. IX to the International Convention for the Safety of Life at Sea (SOLAS) 1974

Intervention Convention—International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (1969)

MARPOL 73/78—International Convention for the Prevention of Pollution from Ships, 1973 and Protocol of 1978, SELECTED PORTIONS

OPRC—International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990

STCW Code—Attachment 2 to the Final Act of the International Convention on Standards of Training, Certification and watchkeeping for Seafarers (STCW), 1995 (SELECTED SECTIONS OF PART A)

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INTERNATIONAL SAFETY MANAGEMENT CODE (ISM CODE)

AND

GUIDELINES ON THE IMPLEMENTATION OF THE ISM CODE

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Foreword

With the entry into force, on 1 July 1998, of the 1994 amendments to the International Convention for the Safety of Life at Sea (SOLAS), 1974, which introduced a new chapter IX into the Convention, the International Safety Management (ISM) Code has been made mandatory.

The Code's origins go back to the late 1980s, when there was mounting concern about poor management standards in shipping. Investigations into accidents revealed major errors on the part of management and in 1987 the IMO Assembly adopted resolution A.596(15), which called upon the Maritime Safety Committee to develop guidelines concerning shipboard and shore-based management to ensure the safe operation of ro-ro passenger ferries.

The ISM Code evolved through the development of the Guidelines on Management for the Safe Operation of Ships and for Pollution Prevention, adopted in 1989 by the IMO Assembly as resolution A.647(16), and the revised Guidelines, adopted two years later as resolution A.680(17), to its current form, the International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management (ISM) Code), which was adopted in 1993 as resolution A.741(18).

In 1995, the IMO Assembly, recognizing the need for uniform implementation of the ISM Code and that there might be a need for Administrations to enter into agreements in respect of the issuance of certificates by other Administrations in accordance with SOLAS chapter IX and the ISM Code, adopted the Guidelines on Implementation of the International Safety Management (ISM) Code by Administrations by resolution A.788(19).

This publication includes the texts of SOLAS chapter IX, the ISM Code and the Guidelines referred to in the previous paragraphs.

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International Convention for the Safety of Life at Sea, 1974
Chapter IX—Management for the Safe Operation of Ships (Resolution A.741(18))

International Safety Management (ISM) Code

Guidelines on Implementation of the International Safety Management (ISM) Code by Administrations (Resolution A.788(19))

Management for the Safe Operation of Ships

Chapter IX[*] of the annex to the 1974 SOLAS Convention

Regulation 1
Definitions

For the purpose of this chapter, unless expressly provided otherwise.

1 *International Safety Management (ISM) Code* means the International Management Code for the Safe Operation of Ships and for Pollution Prevention adopted by the Organization by resolution A.741(18), as may be amended by the Organization, provided that such amendments are adopted, brought into force and take effect in accordance with the provisions of article VIII of the present Convention concerning the amendment procedures applicable to the annex other than chapter I.

2 *Company* means the owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for operation of the ship from the owner of the ship and who on assuming such responsibility has agreed to take over all the duties and responsibilities imposed by the International Safety Management Code.

3 *Oil tanker* means an oil tanker as defined in regulation II-1/2.12.[**]

4 *Chemical tanker* means a chemical tanker as defined in regulation VII/8.2.[***]

5 *Gas carrier* means a gas carrier as defined in regulation VII/11.2.[†]

6 *Bulk carrier* means a ship which is constructed generally with single deck, topside tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk, and includes such types as ore carriers and combination carriers.

[*] The new chapter IX of the annex to the 1974 SOLAS Convention was adopted by the 1994 SOLAS Conference. It will be deemed to have been accepted on 1 January 1998, unless requisite objections have been communicated to the Secretary-General of the Organization prior to this date, and will enter into force on 1 July 1998.

[**] i.e., "the oil tanker defined in regulation 1 of Annex I of the Protocol of 1978 relating to [MARPOL 73]".

[***] i.e., "a cargo ship constructed or adapted and used for the carriage in bulk of any liquid product listed in chapter 17 of the [IBC Code]".

[†] i.e., "a cargo ship constructed or adapted and used for the carriage in bulk of any liquefied gas or other product listed in chapter 19 of the [IGC Code]".

7 *Mobile offshore drilling unit (MODU)* means a vessel capable of engaging in drilling operations for the exploration for or exploitation of resources beneath the sea-bed such as liquid or gaseous hydrocarbons, sulphur or salt.

8 *High-speed craft* means a craft as defined in regulation X/1.2.*

Regulation 2
Application

1 This chapter applies to ships, regardless of the date of construction, as follows:
- **.1** passenger ships including passenger high-speed craft, not later than 1 July 1998;
- **.2** oil tankers, chemical tankers, gas carriers, bulk carriers. and cargo high-speed craft of 500 gross tonnage and upwards, not later than 1 July 1998; and
- **.3** other cargo ships and mobile offshore drilling units of 500 gross tonnage and upwards, not later than 1 July 2002.

2 This chapter does not apply to government-operated ships used for non-commercial purposes.

Regulation 3
Safety management requirements

1 The company and the ship shall comply with the requirements of the International Safety Management Code.

2 The ship shall he operated by a company holding a Document of Compliance referred to in regulation 4.

Regulation 4
Certification

1 A Document of Compliance shall be issued to every company which complies with the requirements of the International Safety Management Code. This document shall be issued by the Administration, by an organization recognized by the Administration, or at the request of the Administration by another Contracting Government.

2 A copy of the Document of Compliance shall be kept on board the ship in order that the master can produce it on request for verification.

3 A Certificate, called a Safety Management Certificate, shall be issued to every ship by the Administration or an organization recognized by the Administration. The

* i.e., "a craft capable of a maximum speed . . . (m/s) equal to or exceeding: $3.7\nabla^{0.1667}$ where: ∇ = displacement corresponding to the design waterline (m^3)".

Administration or organization recognized by it shall, before issuing the Safety Management Certificate, verify that the company and its shipboard management operate in accordance with the approved safety-management system.

Regulation 5
Maintenance of conditions

The safety-management system shall be maintained in accordance with the provisions of the International Safety Management Code.

Regulation 6
Verification and control

1 The Administration, another Contracting Government at the request of the Administration or an organization recognized by the Administration shall periodically verify the proper functioning of the ship's safety-management system.

2 Subject to the provisions of paragraph 31 of this regulation, a ship required to hold a certificate issued pursuant to the provisions of regulation 4.3 shall be subject to control in accordance with the provisions of regulation XI/4. For this purpose such certificate shall be treated as a certificate issued under regulation I/12 or I/13.

3 In cases of change of flag State or company, special transitional arrangements shall be made in accordance with the guidelines developed by the Organization.*

* Refer to the Guidelines on implementation of the ISM Code by Administrations adopted by the Organization by resolution A.788(19), reproduced on page 351 of the present publication.

International Safety Management (ISM) Code

PREAMBLE

1 The purpose of this Code is to provide an international standard for the safe management and operation of ships and for pollution prevention.

2 The Assembly adopted resolution A.443(XI), by which it invited all Governments to take the necessary steps to safeguard the shipmaster in the proper discharge of his responsibilities with regard to maritime safety and the protection of the marine environment.

3 The Assembly also adopted resolution A.680(17), by which it further recognized the need for appropriate organization of management to enable it to respond to the need of those on board ships to achieve and maintain high standards of safety and environmental protection.

4 Recognizing that no two shipping companies or shipowners are the same, and that ships operate under a wide range of different conditions, the Code is based on general principles and objectives.

5 The Code is expressed in broad terms so that it can have a widespread application. Clearly, different levels of management, whether shorebased or at sea, will require varying levels of knowledge and awareness of the items outlined.

6 The cornerstone of good safety management is commitment from the top. In matters of safety and pollution prevention it is the commitment, competence, attitudes and motivation of individuals at all levels that determines the end result.

1 GENERAL

1.1 Definitions

1.1.1 *International Safety Management (ISM) Code* means the International Management Code for the Safe Operation of Ships and for Pollution Prevention as adopted by the Assembly, as may he amended by the Organization.

1.1.2 *Company* means the owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for

operation of the ship from the shipowner and who, on assuming such responsibility, has agreed to take over all duties and responsibility imposed by the Code.

1.1.3 *Administration* means the Government of the State whose flag the ship is entitled to fly.

1.2 Objectives

1.2.1 The objectives of the Code are to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and to property.

1.2.2 Safety-management objectives of the Company should, *inter alia*:

- **.1** provide for safe practices in ship operation and a safe working environment;
- **.2** establish safeguards against all identified risks; and
- **.3** continuously improve safety-management skills of personnel ashore and aboard ships, including preparing for emergencies related both to safety and environmental protection.

1.2.3 The safety-management system should ensure:

- **.1** compliance with mandatory rules and regulations; and
- **.2** that applicable codes, guidelines and standards recommended by the Organization, Administrations, classification societies and maritime industry organizations are taken into account.

1.3 Application

The requirements of this Code may be applied to all ships.

1.4 Functional requirements for a safety-management system

Every Company should develop, implement and maintain a safety-management system (SMS) which includes the following functional requirements:

- **.1** a safety and environmental-protection policy;
- **.2** instructions and procedures to ensure safe operation of ships and protection of the environment in compliance with relevant international and flag State legislation;
- **.3** defined levels of authority and lines of communication between, and amongst, shore and shipboard personnel;
- **.4** procedures for reporting accidents and non-conformities with the provisions of this Code;
- **.5** procedures to prepare for and respond to emergency situations; and
- **.6** procedures for internal audits and management reviews.

2 SAFETY AND ENVIRONMENTAL-PROTECTION POLICY

2.1 The Company should establish a safety and environmental-protection policy which describes how the objectives given in paragraph 1.2 will be achieved.

2.2 The Company should ensure that the policy is implemented and maintained at all levels of the organization both, ship-based and shore-based.

3 COMPANY RESPONSIBILITIES AND AUTHORITY

3.1 If the entity who is responsible for the operation of the ship is other than the owner, the owner must report the full name and details of such entity to the Administration.

3.2 The Company should define and document the responsibility, authority and interrelation of all personnel who manage, perform and verify work relating to and affecting safety and pollution prevention.

3.3 The Company is responsible for ensuring that adequate resources and shore-based support are provided to enable the designated person or persons to carry out their functions.

4 DESIGNATED PERSON(S)

To ensure the safe operation of each ship and to provide a link between the Company and those on board, every Company, as appropriate, should designate a person or persons ashore having direct access to the highest level of management. The responsibility and authority of the designated person or persons should include monitoring the safety and pollution-prevention aspects of the operation of each ship and ensuring that adequate resources and shore-based support are applied, as required.

5 MASTER'S RESPONSIBILITY AND AUTHORITY

5.1 The Company should clearly define and document the master's responsibility with regard to:

- **.1** implementing the safety and environmental-protection policy of the Company;
- **.2** motivating the crew in the observation of that policy;
- **.3** issuing appropriate orders and instructions in a clear and simple manner;
- **.4** verifying that specified requirements are observed; and
- **.5** reviewing the SMS and reporting its deficiencies to the shore-based management.

5.2 The Company should ensure that the SMS operating on board the ship contains a clear statement emphasizing the master's authority. The Company should establish

in the SMS that the master has the overriding authority and the responsibility to make decisions with respect to safety and pollution prevention and to request the Company's assistance as may be necessary.

6 RESOURCES AND PERSONNEL

6.1 The Company should ensure that the master is:

.1 properly qualified for command;
.2 fully conversant with the Company's SMS; and
.3 given the necessary support so that the master's duties can be safely performed.

6.2 The Company should ensure that each ship is manned with qualified, certificated and medically fit seafarers in accordance with national and international requirements.

6.3 The Company should establish procedures to ensure that new personnel and personnel transferred to new assignments related to safety and protection of the environment are given proper familiarization with their duties. Instructions which are essential to be provided prior to sailing should be identified, documented and given.

6.4 The Company should ensure that all personnel involved in the Company's SMS have an adequate understanding of relevant rules, regulations, codes and guidelines.

6.5 The Company should establish and maintain procedures for identifying any training which may be required in support of the SMS and ensure that such training is provided for all personnel concerned.

6.6 The Company should establish procedures by which the ship's personnel receive relevant information on the SMS in a working language or languages understood by them.

6.7 The Company should ensure that the ship's personnel are able to communicate effectively in the execution of their duties related to the SMS.

7 DEVELOPMENT OF PLANS FOR SHIPBOARD OPERATIONS

The Company should establish procedures for the preparation of plans and instructions for key shipboard operations concerning the safety of the ship and the prevention of pollution. The various tasks involved should be defined and assigned to qualified personnel.

8 EMERGENCY PREPAREDNESS

8.1 The Company should establish procedures to identify, describe and respond to potential emergency shipboard situations.

8.2 The Company should establish programmes for drills and exercises to prepare for emergency actions.

8.3 The SMS should provide for measures ensuring that the Company's organization can respond at any time to hazards, accidents and emergency situations involving its ships.

9 REPORTS AND ANALYSIS OF NON-CONFORMITIES, ACCIDENTS AND HAZARDOUS OCCURRENCES

9.1 The SMS should include procedures ensuring that non-conformities, accidents and hazardous situations are reported to the Company, investigated and analysed with the objective of improving safety and pollution prevention.

9.2 The Company should establish procedures for the implementation of corrective action.

10 MAINTENANCE OF THE SHIP AND EQUIPMENT

10.1 The Company should establish procedures to ensure that the ship is maintained in conformity with the provisions of the relevant roles and regulations and with any additional requirements which may be established by the Company.

10.2 In meeting these requirements the Company should ensure that:

- **.1** inspections are held at appropriate intervals;
- **.2** any non-conformity is reported, with its possible cause, if known;
- **.3** appropriate corrective action is taken; and
- **.4** records of these activities are maintained.

10.3 The Company should establish procedures in its SMS to identify equipment and technical systems the sudden operational failure of which may result in hazardous situations. The SMS should provide for specific measures aimed at promoting the reliability of such equipment or systems. These measures should include the regular testing of stand-by arrangements and equipment or technical systems that are not in continuous use.

10.4 The inspections mentioned in 10.2 as well as the measures referred to in 10.3 should be integrated in to the ship's operational maintenance routine.

11 DOCUMENTATION

11.1 The Company should establish and maintain procedures to control all documents and data which are relevant to the SMS.

11.2 The Company should ensure that:

- **.1** valid documents are available at all relevant locations;

.2 changes to documents are reviewed and approved by authorized personnel; and

.3 obsolete documents are promptly removed.

11.3 The documents used to describe and implement the SMS may be referred to as the Safety Management Manual. Documentation should be kept in a form that the Company considers most effective. Each ship should carry on board all documentation relevant to that ship.

12 COMPANY VERIFICATION, REVIEW AND EVALUATION

12.1 The Company should carry out internal safety audits to verify whether safety and pollution-prevention activities comply with the SMS.

12.2 The Company should periodically evaluate the efficiency of and, when needled, review the SMS in accordance with procedures established by the Company.

12.3 The audits and possible corrective actions should be carried out in accordance with documented procedures.

12.4 Personnel carrying out audits should be independent of the areas being audited unless this is impracticable due to the size and the nature of the Company.

12.5 The results of the audits and reviews should be brought to the attention of all personnel having responsibility in the area involved.

12.6 The management personnel responsible for the area involved should take timely corrective action on deficiencies found.

13 CERTIFICATION, VERIFICATION AND CONTROL

13.1 The ship should be operated by a Company which is issued a document of compliance relevant to that ship.

13.2 A document of compliance should be issued for every Company complying with the requirements of the ISM Code by the Administration, by an organization recognized by the Administration or by the Government of the country, acting on behalf of the Administration in which the Company has chosen to conduct its business. This document should be accepted as evidence that the Company is capable of complying with the requirements of the Code.

13.3 A copy of such a document should be placed on board in order that the master, if so asked, may produce it for the verification of the Administration or organizations recognized by it.

13.4 A certificate, called a Safety Management Certificate, should be issued to a ship by the Administration or organization recognized by the Administration. The

Administration should, when issuing the certificate, verify that the Company and its shipboard management operate in accordance with the approved SMS.

13.5 The Administration or an organization recognized by the Administration should periodically verify the proper functioning of the ship's SMS as approved.

Guidelines on Implementation of the International Safety Management (ISM) Code by Administrations

Resolution A.788(19)

INTRODUCTION

The ISM Code

The International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management (ISM) Code) was adopted by the Organization by resolution A.741(18) and will be made mandatory by virtue of the entry into force on 1 July 1998 of SOLAS chapter IX on Management for the Safe Operation of Ships. The ISM Code provides an international standard for the safe management and operation of ships and for pollution prevention.

The ISM Code requires that Companies establish safety objectives as described in section 1.2 of the ISM Code, and in addition that the Companies develop, implement and maintain a safety management system (SMS) which includes functional requirements as listed in section 1.4 of the ISM Code

The application of the ISM Code should *support and encourage* the development of a safety culture in shipping. Success factors for the development of a safety culture are, *inter alia*, commitment, values and beliefs.

Mandatory application of the ISM Code

The appropriate organization of management, ashore and on board, is needed to ensure adequate standards of safety. A systematic approach to management by those responsible for management of ships is therefore required. The objectives of the mandatory application of the ISM Code are to ensure:

.1 compliance with mandatory rules and regulations related to the safe operation of ships and protection of the environment; and

.2 the effective implementation and enforcement thereof by Administrations.

Effective enforcement by Administrations must include verification that the SMS complies with the requirements as stipulated in the ISM Code, as well as verification of compliance with mandatory rules and regulations

The mandatory application of the ISM Code should ensure, support and encourage that applicable codes, guidelines and standards recommended by the Organization, Administrations, classification societies and maritime industry organizations are taken into account.

Verification and certification responsibilities

The Administration is responsible for verifying compliance with the requirements of the ISM Code and issuing Documents of Compliance (DOC) to Companies and Safety Management Certificates (SMC) to ships.

Resolution A.739(18), Guidelines for the Authorization of organizations Acting on Behalf of the Administration, which has been made mandatory by virtue of the new SOLAS chapter XI, and resolution A.740(18), Interim Guidelines to Assist Flag States, are applicable when Administrations authorize organizations to issue DOC and SMC on their behalf.

1 SCOPE AND APPLICATION

1.1 Definitions

1.1.1 *International Safety Management (ISM) Code* means the International Management Code for the Safe Operation of Ships and for Pollution Prevention, as adopted by the Organization by resolution A.741(18), as may be amended by the Organization.

1.1.2 *Company* means the owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for operation of the ship from the shipowner and who on assuming such responsibility has agreed to take over all the duties and responsibilities imposed by the ISM Code.

1.1.3 *Administration* means the Government of the State whose flag the ship is entitled to fly.

1.1.4 *Safety management system (SMS)* means a structured and documented system enabling Company personnel to effectively implement the Company safety and environmental protection policy.

1.1.5 *Document of Compliance (DOC)* means a document issued to a Company which complies with the requirements of the ISM Code.

1.1.6 *Safety Management Certificate (SMC)* means a document issued to a ship which signifies that the Company and its shipboard management operate in accordance with the approved SMS.

1.1.7 *Safety management audit* means a systematic and independent examination to determine whether the SMS activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.

1.1.8 *Observation* means a statement of fact made during a safety management audit and substantiated by objective evidence.

1.1.9 *Objective evidence* means quantitative or qualitative information records or statements of fact pertaining to safety or to the existence and implementation of an SMS element, which is based on observation, measurement or test and which can be verified.

1.1.10 *Non-conformity* means an observed situation where objective evidence indicates the non-fulfilment of a specified requirement.

1.1.11 *Major non-conformity* means an identifiable deviation which poses a serious threat to personnel or ship safety or a serious risk to the environment and requires immediate corrective action; in addition, the lack of effective and systematic implementation of a requirement of the SM Code is also considered as a major non-conformity.

1.2 Scope and application

1.2.1 These Guidelines establish basic principles:

.1 for verifying that the SMS of a Company responsible for the operation of ships or the SMS for the ship or ships controlled by the company complies with the SM Code; and

.2 for the issue and periodical verification of the DOC and SMC.

1.2.2 These Guidelines are applicable to Administrations.

2 VERIFYING COMPLIANCE WITH THE ISM CODE

2.1 General

2.1.1 To comply with the requirements of the SM Code, Companies should develop, implement and maintain an SMS to ensure that the safety and environmental protec-

tion policy of the Company is implemented. The Company policy should include the objectives defined by the SM Code.*

2.1.2 Administrations should verify compliance with the requirements of the ISM Code by determining:

.1 the conformity of the Company's SMS with the requirements of the ISM Code; and
.2 that the SMS ensures that the objectives defined in paragraph 1.2.3 of the ISM Code are met.

2.1.3 Determining conformity or non-conformity of the SMS elements with the requirements specified by the ISM Code may demand that criteria for assessment be developed. Administrations are recommended to limit the development of criteria in the form of prescriptive management system solutions. Criteria for assessment in the form of prescriptive requirements may have the effect that safety management in shipping results in Companies implementing solutions prepared by others, it may then be difficult for a Company to develop the solutions which best suit that particular Company, that particular operation or that specific ship.

2.1.4 Therefore, Administrations are recommended to ensure that these assessments are based on determining the effectiveness of the SMS in meeting specified objectives, rather than conformity with detailed requirements in addition to those contained in the ISM Code, so as to reduce the need for developing criteria to facilitate assessment of the Companies' compliance with the ISM Code.

2.2 The ability of the SMS to meet general safety management objectives

2.2.1 The ISM Code identifies general safety management objectives. These objectives are:

.1 to provide for safe practices in ship operation and a safe working environment;
.2 to establish safeguards against all identified risks; and
.3 to continuously improve the safety-management skills of personnel ashore and aboard, including preparing for emergencies related both to safety and environmental protection.

The verification should support and encourage Companies in achieving these objectives.

2.2.2 These objectives provide clear guidance to Companies for the development of SMS elements in compliance with the ISM Code. Since, however, the ability of the

* The ICS/ISF Guidelines on the Application of the International Safety Management Code (A.18/INF.5) provide useful guidance on important individual elements of an SMS and its development by Companies.

SMS in achieving these objectives cannot be determined beyond whether the SMS complies with the requirements of the ISM Code, they should not form the basis for establishing detailed interpretations to be used for determining conformity or non-conformity with the requirements of the ISM Code.

2.3 The ability of the SMS to meet specific requirements of safety and pollution prevention

2.3.1 The main criteria which should govern the development of interpretations needed for assessing compliance with the requirements of the ISM Code should be the ability of the SMS to meet the specific requirements defined by the ISM Code in terms of specific standards of safety and pollution prevention.

The specific standards of safety and protection of the environment specified by the ISM Code are:

.1 compliance with mandatory rules and regulations; and
.2 that applicable codes, guidelines and standards recommended by the Organization, Administrations, classification societies and other maritime industry organizations are taken into account.

2.3.2 All records having the potential to facilitate verification of compliance with the ISM Code should be open to scrutiny during an examination. For this purpose the Administration should ensure that the Company provide auditors with statutory and classification records relevant to the actions taken by the Company to ensure that compliance with mandatory rules and regulations is maintained. In this regard the records may be examined to substantiate their authenticity and veracity.

2.3.3 Some mandatory requirements may not be subject to statutory or classification surveys, such as:

.1 maintaining the condition of ship and equipment between surveys; and
.2 certain operational requirements.

Specific arrangements may be required to ensure compliance and to provide for the objective evidence needed for verification in these cases, such as:

.1 documented procedures and instructions; and
.2 documentation of the verification carried out by senior officers of day-to-day operation when relevant to ensure compliance.

2.3.4 The verification of compliance with mandatory rules and regulations, which is part of the ISM Code certification, neither duplicates nor substitutes surveys for other maritime certificates. The verification of compliance with the ISM Code does not relieve the Company, the master or any other entity or person involved in the management or operation of the ship of their responsibilities.

2.3.5 Administrations should ensure that the Company has:

.1 taken into account the recommendations, as referred to in 1.2.3.2 of the ISM Code, when establishing the SMS; and
.2 developed procedures to ensure that these recommendations are implemented on shore and on board.

2.3.6 Within an SMS, implementation of codes, guidelines and standards recommended by the Organization, Administrations, classification societies and other maritime industry organizations does not make these recommendations mandatory under the ISM Code. Nevertheless auditors should encourage companies to adopt these recommendations whenever applicable to the Company.

3 ISSUANCE AND VALIDITY OF DOC AND SMC

3.1 Issuance and validity of the DOC

3.1.1 The DOC should be issued to a Company following an initial verification of compliance with the requirements of the ISM Code.

3.1.2 The DOC should be issued following verification that the SMS of the Company complies with the requirements of the ISM Code and determination of objective evidence proving that it is effectively implemented. The verification should include objective evidence demonstrating that the Company SMS has been in operation for at least three months, and an SMS has been in operation on board at least one ship of each type operated by the Company for at least three months. The objective evidence should, *inter alia*, include records from the internal annual audit performed by the Company, ashore and on board.

3.1.3 The DOC is valid for the types of ships on which the initial verification was based.

3.1.4 The validity of a DOC may be extended to cover additional ship types after verification of the Company's capability to comply with the requirements of the ISM Code for such ship types. In this context, ship types are those referred to SOLAS chapter IX.

3.1.5 The DOC is valid for a period of five years.

3.1.6 The validity of the DOC is subject to annual verification within three months before or after the anniversary date to confirm the effective functioning of the SMS. This should include examining and verifying the correctness of the statutory and classification records presented for at least one ship of each type to which the DOC applies. Corrective actions and modifications to the SMS carried out since the previous verification should be verified.

3.1.7 Renewal of the DOC for a further period of five years should include assessment of all the elements of the SMS regarding its effectiveness in meeting the objectives specified in the ISM Code.

3.1.8 Only the issuing Administration may withdraw the DOC. The issuing Administration should withdraw the DOC if the periodical verification is not requested or if there is evidence of major non-conformity with the ISM Code. The SMCs associated with the DOC should also be invalidated and withdrawn.

3.2 Issuance and validity of the SMC

3.2.1 The SMC should be issued to a ship following an initial verification of compliance with the requirements of the ISM Code. This includes the verification that the DOC for the Company responsible for the operation of the ship is applicable to that particular type of ship, and assessment of the shipboard SMS to verify that it complies with the requirements of the ISM Code, and that it is implemented. Objective evidence demonstrating that the Company's SMS has been functioning effectively for at least three months on board the ship should be available, including, *inter alia*, records from the internal audit performed by the Company.

3.2.2 The SMC is valid for a period of five years.

3.2.3 The validity of the SMC is subject to at least one intermediate verification, confirming the effective functioning of the SMS, and that any modifications carried out since the previous verification comply with the requirements of the ISM Code. In certain cases, particularly during the initial period of operation under the SMS, the Administration may find it necessary to increase the frequency of the intermediate verification. Additionally, the nature of non-conformities may also provide a basis for increasing the frequency of intermediate verifications.

3.2.4 Renewal of the SMC for a further period of five years should include an assessment of all elements of the SMS pertaining to that ship and regarding its effectiveness of the SMS in meeting the objectives specified in the ISM Code.

3.2.5 Only the issuing Administration may withdraw the SMC. The issuing Administration should withdraw the SMC if intermediate verification is not requested or if there is evidence of major non-conformity with the ISM Code.

3.3 Interim DOC and SMC

3.3.1 In cases of change of flag or Company, special transitional arrangements should be made in accordance with these Guidelines.

3.3.2 An Interim DOC may be issued to facilitate initial implementation of the SM Code and implementation where a Company is newly established or where new ship types are added to an existing DOC.

3.3.3 An Administration may issue an Interim DOC, valid for no more than 12 months, to a Company following a demonstration that the Company has an SMS that meets the objectives of paragraph 1.2.3 of the ISM Code. The Administration should require the Company to demonstrate plans to implement an SMS meeting the full requirements of the ISM Code within the period of validity of the Interim DOC.

3.3.4 An Interim SMC, valid for not more than six months, may be issued to new ships on delivery, and when a Company takes on the responsibility for the management of a ship which is new to the Company. In special cases the Administration may extend the validity of the Interim SMC for a further six months.

3.3.5 Before issuing an Interim SMC, the Administration should verify that:

- **.1** the DOC, or the Interim DOC, is relevant to that ship;
- **.2** the SMS provided by the Company for the ship includes key elements of the ISM Code and has been assessed during the audit for issuance of the DOC or demonstrated for issuance of the Interim DOC (see 3.3.3);
- **.3** the master and relevant senior officers are familiar with the SMS and the planned arrangements for its implementation;
- **.4** instructions which have been identified as essential to be provided prior to sailing have been given;
- **.5** plans for Company audit of the ship within three months exist; and
- **.6** the relevant information on the SMS is given in a working language or languages understood by the ship's personnel.

4 THE CERTIFICATION PROCESS

4.1 Certification activities

4.1.1 The certification process relevant for the issuance of a DOC for a Company and an SMC to a ship will normally involve the following steps:

- **.1** initial verification;
- **.2** periodical or intermediate verification; and
- **.3** renewal verification.

These verifications are carried out at the request of the Company to the Administration, or to the organization recognized by the Administration to perform certification functions under the ISM Code.

The verifications will include an audit of the SMS.

4.2 Initial verification

4.2.1 The Company should apply for ISM Code certification to the Administration.

4.2.2 An assessment of the shore side management system undertaken by the Administration would necessitate assessment of the offices where such management is carried out and possibly other locations depending on the Company's organization and functions of the various locations.

4.2.3 On satisfactory completion of the assessment of the shore side SMS, arrangements/planning may commence for the assessment of the Company's ships.

4.2.4 On satisfactory completion of the assessment, a DOC will be issued to the Company, copies of which should be forwarded to each shore side premises and each ship in the Company's fleet. As each ship is assessed and issued with an SMC, a copy of it should also be forwarded to the Company's head office.

4.2.5 In cases where certificates are issued by a recognized organization, copies of all certificates should also be sent to the Administration.

4.2.6 The safety management audit for the Company and for a ship will involve the same basic steps. The purpose is to verify that a Company or a ship comply with the requirements of the ISM Code. The audits include:

.1 the conformity of the Company's SMS with the requirements of the ISM Code; and

.2 that the SMS ensures that the objectives defined in paragraph 1.2.3 of the ISM Code are met.

4.3 Periodical verification of DOC

4.3.1 Periodical safety management audits are to be carried out to maintain the validity of the DOC. The purpose of these audits is to verify the effective functioning of the SMS, and that any modifications made to the SMS comply with the requirements of the ISM Code.

4.3.2 Periodical verification is to be carried out within three months before and after each anniversary date of DOC. A schedule not exceeding three months is to be agreed for completion of the necessary corrective actions.

4.3.3 Where the Company has more than one shore side premises, each of which may not have been visited at the initial assessment, the periodical assessments should endeavour to ensure that all sites are visited during the period of validity of the DOC.

4.4 Intermediate verification of SMC

4.4.1 Intermediate safety management audits should be carried out to maintain the validity of the SMC. The purpose of these audits is to verify the effective functioning of the SMS and that any modifications made to the SMS comply with the requirements of the ISM Code.

4.4.2 If only one intermediate verification is to be carried out, it should take place between the second and third anniversary date of the issue of the SMC.

4.5 Renewal verification

Renewal verifications are to be performed before the validity of the DOC or the SMC expires. The renewal verification will address all the elements of the SMS and the activities to which the requirements of the ISM Code apply. Renewal verification may be carried out from six months before the expiry date of the DOC or the SMC and should be completed before their expiry date.

4.6 Safety management audits

The procedure for safety management audits outlined in the following paragraphs includes all steps relevant for initial verification. Safety management audits for periodical verification and renewal verification should be based on the same principles even if their scope may be different.

4.7 Application for audit

4.7.1 The Company should submit a request for audit to the Administration or to the organization recognized by the Administration for issuing DOC or SMC on behalf of the Administration.

4.7.2 The Administration or the recognized organization should then nominate the lead auditor and, if relevant, the audit team.

4.8 Preliminary review

As a basis for planning the audit, the auditor should review the safety management manual to determine the adequacy of the SMS in meeting the requirements of the ISM Code. If this review reveals that the system is not adequate, the audit will have to be delayed until the Company undertakes corrective action.

4.9 Preparing the audit

4.9.1 The nominated lead auditor should liaise with the Company and produce an audit plan.

4.9.2 The auditor should provide the working documents which are to govern the execution of the audit to facilitate the assessments, investigations and examinations in accordance with the standard procedures, instructions and forms which have been established to ensure consistent auditing practices.

4.9.3 The audit team should be able to communicate effectively with auditees.

4.10 Executing the audit

4.10.1 The audit should start with an opening meeting in order to introduce the audit team to the Company's senior management, summarize the methods for conducting the audit, confirm that all agreed facilities are available, confirm time and date for a closing meeting and clarify possible unclear details relevant to the audit.

4.10.2 The audit team should assess the SMS on the basis of the documentation presented by the Company and objective evidence as to its effective implementation.

4.10.3 Evidence should be collected through interviews and examination of documents. Observation of activities and conditions may also be included when necessary to determine the effectiveness of the SMS in meeting the specific standards of safety and protection of the environment required by the ISM Code.

4.10.4 Audit observations should be documented. After activities have been audited, the audit team should review their observations to determine which are to be reported as non-conformities. Non-conformities should be reported in terms of the general and specific provisions of the ISM Code.

4.10.5 At the end of the audit, prior to preparing the audit report, the audit team should hold a meeting with the senior management of the Company and those responsible for the functions concerned. The purpose is to present the observations to ensure that the results of the audit are clearly understood.

4.11 Audit report

4.11.1 The audit report should be prepared under the direction of the lead auditor, who is responsible for its accuracy and completeness.

4.11.2 The audit report should include the audit plan, the identification of audit team members, dates and identification of the Company, observations on any non-conformities and observations on the effectiveness of the SMS in meeting the specified objectives.

4.11.3 The Company should receive a copy of the audit report. The Company should be advised to provide a copy of the shipboard audit reports to the ship.

4.12 Corrective action follow-up

4.12.1 The Company is responsible for determining and initiating the corrective action needed to correct a non-conformity or to correct the cause of the non-conformity. Failure to correct non-conformities with specific requirements of the ISM Code may affect the validity of the DOC and related SMCs.

4.12.2 Corrective actions and possible subsequent follow-up audits should be completed within the time period agreed. The Company should apply for the follow-up audits.

4.13 Company responsibilities pertaining to safety management audits

4.13.1 The verification of compliance with the requirements of the ISM Code does not relieve the Company, management, officers or seafarers of their obligations as to compliance with national and international legislation related to safety and protection of the environment.

4.13.2 The Company is responsible for:

.1 informing relevant employees about the objectives and scope of the ISM Code certification;
.2 appointing responsible members of staff to accompany members of the team performing the certification;
.3 providing the resources needed by those performing the certification to ensure an effective and efficient verification process;
.4 providing access and evidential material as requested by those performing the certification; and
.5 co-operating with the verification team to permit the certification objectives to be achieved.

4.14 Responsibilities of the organization performing the ISM Code certification

The organization performing the ISM Code certification is responsible for ensuring that the certification process is performed according to the ISM Code and these Guidelines. This includes management control of all aspects of the certification according to Appendix 1 to these Guidelines.

4.15 Responsibilities of the verification team

4.15.1 Whether the verifications involved with certification are performed by a team or not, one person should be in charge of the verification. The leader should be given the authority to make final decisions regarding the conduct of the verification and any observations. His responsibilities should include:

.1 preparation of a plan for the verification; and
.2 submission of the report of the verification.

4.15.2 Personnel participating in the verification are responsible for complying with the requirements governing the verification, ensuring confidentiality of documents pertaining to the certification and treating privileged information with discretion.

4.16 Forms of DOC and SMC

The DOC, SMC and Interim DOC and Interim SMC should be drawn up in the form corresponding to the models given in Appendix 2 to these Guidelines. If the language used is neither English or French, the text should include a translation into one of these languages.

Appendix 1

Standards on ISM Code Certification Arrangements

1 INTRODUCTION

The audit team, and the organization under which it may be managed, involved with ISM Code certification should comply with the specific requirements stated in this annex.

2 STANDARD OF MANAGEMENT

2.1 Organizations managing verification of compliance with the ISM Code should have, in their own organization, competence in relation to:

- **.1** ensuring compliance with the rules and regulations including certification of seafarers, for the ships operated by the Company;
- **.2** the approval, survey and certification activities relevant for the maritime certificates;
- **.3** the terms of reference that must be taken into account under the SMS as required by the ISM Code; and
- **.4** practical experience of ship operation.

2.2 The 1974 SOLAS Convention requires that organizations recognized by Administrations for issuing DOC and SMC at their request should comply with resolution A.739(18).

2.3 Any organization performing verification of compliance with the provisions of the ISM Code should ensure that there exists independence between the personnel providing consultancy services and those involved in the certification procedure.

3 STANDARDS OF COMPETENCE

3.1 ISM Code certification scheme management

Management of ISM Code certification schemes should be carried out by those who have practical knowledge of ISM Code certification procedures and practices.

3.2 Basic competence for performing verification

3.2.1 Personnel who are to participate in the verification of compliance with the requirements of the ISM Code should have a minimum of formal education comprising the following:

.1 qualifications from a tertiary institution recognized by the Administration or by the recognized organization within a relevant field of engineering or physical science (minimum two years programme), or

.2 qualifications from a marine or nautical institution and relevant sea-going experience as a certified ship officer.

3.2.2 They should have undergone training to ensure adequate competence and skills for performing verification of compliance with the requirements of the ISM Code, particularly with regard to:

.1 knowledge and understanding of the ISM Code;

.2 mandatory rules and regulations;

.3 the terms of reference which the ISM Code requires that Companies should take into account;

.4 assessment techniques of examining, questioning, evaluating and reporting;

.5 technical or operational aspects of safety management;

.6 basic knowledge of shipping and shipboard operations; and

.7 participation in at least one marine related management system audit.

3.2.3 Such competence should be demonstrated through written or oral examinations, or other acceptable means.

3.3 Competence for initial verification and renewal verification

3.3.1 In order to assess fully whether the Company or the ship complies with the requirements of the ISM Code, in addition to the basic competence stated under section 3.2 above, personnel who are to perform initial verifications or renewal verifications for a DOC or SMC, must possess the competence to:

.1 determine whether the SMS elements conform or do not conform with the requirements of the ISM Code;

.2 determine the effectiveness of the Company's SMS, or that of the ship, to ensure compliance with rules and regulations as evidenced by the statutory and classification survey records;

.3 assess the effectiveness of the SMS in ensuring compliance with other rules and regulations which are not covered by statutory and classification surveys and enabling verification of compliance with these rules and regulations; and

.4 assess whether the safe practices recommended by the Organization, Administrations, classification societies and maritime industry organizations have been taken into account.

3.3.2 This competence can be accomplished by teams which together possess the total competence required.

3.3.3 Personnel who are to be in charge of initial verification or renewal verification of compliance with the requirements of the ISM Code should have at least five years experience in areas relevant to the technical or operational aspects of safety management; and have participated in at least three initial verifications or renewal verifications. Participation in verification of compliance with other management standards may be considered as equivalent to participation in verification of compliance with the ISM Code.

3.4 Competence for periodical, intermediate and interim verification

Personnel who are to perform periodical, intermediate and interim verifications should satisfy basic requirements for personnel participating in verifications and should have participated in a minimum of two periodical, renewal or initial verifications. They should have received special instructions needed to ensure that they possess the competence required to determine the effectiveness of the Company's SMS.

4 QUALIFICATION ARRANGEMENTS

Organizations performing ISM Code certification should have implemented a documented system for qualification and continuous updating of the knowledge and competence of personnel who are to perform verification of compliance with the ISM Code. This system should comprise theoretical training courses covering all the competence requirements and the appropriate procedures connected to the certification process, as well as practical tutored training, and it should provide documented evidence of satisfactory completion of the training.

5 CERTIFICATION PROCEDURES AND INSTRUCTIONS

Organizations performing ISM Code certification should have implemented a documented system to ensure that the certification process is performed in accordance with this standard. This system should, *inter alia*, include procedures and instructions for the following:

.1 contract agreements with Companies;
.2 planning, scheduling and performing verification;
.3 reporting results from verification;
.4 issuance of DOC, SMS and Interim DOC and SMC; and
.5 corrective action and follow-up of verifications, including actions to be taken in cases of major non-conformity.

International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (1969)

and

Protocol
Relating to Intervention on the High Seas
in Cases of Pollution by Substances
Other Than Oil, 1973

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Foreword

This publication* contains the text of the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, done at Brussels on 29 November 1969 and the text of the Protocol Relating to Intervention on the High Seas in Cases of Pollution by Substances Other than Oil, 1973, done at London on 2 November 1973, including the Annex containing a list of substances established by the Marine Environment Protection Committee of IMCO in accordance with paragraph 2(a) of Article I of the Protocol. The Convention entered into force on 6 May 1975 and the Protocol entered into force on 30 March 1983.

* This edition incorporates a rectification made in the title of the Protocol as a consequence of a Procès-verbal of Rectification dated 14 October 1977.

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INTERNATIONAL CONVENTION RELATING TO INTERVENTION ON THE HIGH SEAS IN CASES OF OIL POLLUTION CASUALTIES*

The States Parties to the present Convention,

CONSCIOUS of the need to protect the interests of their peoples against the grave consequences of a maritime casualty resulting in danger of oil pollution of sea and coastlines,

CONVINCED that under these circumstances measures of an exceptions character to protect such interests might be necessary on the high seas and that these measures do not affect the principle of freedom of the high seas,

HAVE AGREED as follows:

Article I

1. Parties to the present Convention may take such measures on the high sea as may be necessary to prevent, mitigate or eliminate grave and imminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil, following upon a maritime casualty or acts related to such a casualty which may reasonably be expected to result in major harmful consequences.

2. However, no measures shall be taken under the present Convention against any warship or other ship owned or operated by a State and used, for the time being, only on government non-commercial service.

Article II

For the purposes of the present Convention:

1. "Maritime casualty" means a collision of ships, stranding or other incident of navigation, or other occurrence on board a ship or external to it resulting in material damage or imminent threat of material damage to a ship or cargo;

2. "Ship" means:
   (a) any sea-going vessel of any type whatsoever, and

* The Convention was done by the International Legal Conference on Marine Pollution Damage in Brussels on 29 November 1969. It entered into force on 6 May 1975.

(b) any floating craft, with the exception of an installation or device engaged in the exploration and exploitation of the resources of the sea bed and the ocean floor and the subsoil thereof;

3. "Oil" means crude oil, fuel oil, diesel oil and lubricating oil;

4. "Related interests" means the interests of a coastal State directly affected or threatened by the maritime casualty, such as:

(a) maritime coastal, port or estuarine activities, including fisheries activities, constituting an essential means of livelihood of the person concerned;
(b) tourist attractions of the area concerned;
(c) the health of the coastal population and the well-being of the area concerned, including conservation of living marine resources and of wildlife;

5. "Organization" means the Inter-Governmental Maritime Consultative Organization.

Article III

When a coastal State is exercising the right to take measures in accordance with Article I, the following provisions shall apply:

(a) before taking any measures, a coastal State shall proceed to consultations with other States affected by the maritime casualty, particularly with the flag State or States;
(b) the coastal State shall notify without delay the proposed measures to any persons physical or corporate known to the coastal State, or made known to it during the consultations, to have interests which can reasonably be expected to be affected by those measures. The coastal State shall take into account any views they may submit:
(c) before any measure is taken, the coastal State may proceed to a consultation with independent experts, whose names shall be chosen from a list maintained by the Organization;
(d) in cases of extreme urgency requiring measures to be taken immediately, the coastal State may take measures rendered necessary by the urgency of the situation, without prior notification or consultation or without continuing consultations already begun;
(e) a coastal State shall, before taking such measures and during their course, use its best endeavours to avoid any risk to human life, and to afford persons in distress any assistance of which they may stand in need, and in appropriate cases to facilitate the repatriation of ships' crews, and to raise no obstacle thereto;

(f) measures which have been taken in application of Article I shall be notified without delay to the States and to the known physical or corporate persons concerned, as well as to the Secretary-General of the Organization.

Article IV

1. Under the supervision of the Organization, there shall be set up and maintained the list of experts contemplated by Article III of the present Convention, and the Organization shall make necessary and appropriate regulations in connexion therewith, including the determination of the required qualifications.

2. Nominations to the list may be made by Member States of the Organization and by Parties to this Convention. The experts shall be paid on the basis of services rendered by the States utilizing those services.

Article V

1. Measures taken by the coastal State in accordance with Article I shall proportionate to the damage actual or threatened to it.

2. Such measures shall not go beyond what is reasonably necessary to achieve the end mentioned in Article I and shall cease as soon as that end has been achieved; they shall not unnecessarily interfere with the rights and interests the flag State, third States and of any persons, physical or corporate, concerns.

3. In considering whether the measures are proportionate to the damage account shall be taken of:

(a) the extent and probability of imminent damage if those measures are not taken; and
(b) the likelihood of those measures being effective; and
(c) the extent of the damage which may be caused by such measures.

Article VI

Any Party which has taken measures in contravention of the provision in the present Convention causing damage to others, shall be obliged to pay compensation to the extent of the damage caused by measures which exclude those reasonably necessary to achieve the end mentioned in Article I.

Article VII

Except as specifically provided, nothing in the present Convention shall prejudice any otherwise applicable right, duty, privilege or immunity or deprive any of

the Parties or any interested physical or corporate person of any remedy otherwise applicable.

Article VIII

1. Any controversy between the Parties as to whether measures taken under Article I were in contravention of the provisions of the present Convention and whether compensation is obliged to be paid under Article VI, and to the amount of such compensation shall, if settlement by negotiation between the Parties involved or between the Party which took the measures and the physical or corporate claimants has not been possible, and if the Parties do not otherwise agree, be submitted upon request of any of the Parties concerned to conciliation or, if conciliation does not succeed, to arbitration, as set out in the Annex to the present Convention.

2. The Party which took the measures shall not be entitled to refuse a request for conciliation or arbitration under provisions of the preceding paragraph solely on the grounds that any remedies under municipal law in its own country have not been exhausted.

Article IX

1. The present Convention shall remain open for signature until 31 December 1970 and shall thereafter remain open for accession.

2. States Members of the United Nations or any of the Specialized Agencies or of the International Atomic Energy Agency or Parties to the Statute of the International Court of Justice may become Parties to this Convention by:

(a) signature without reservation as to ratification, acceptance or approval;
(b) signature subject to ratification, acceptance or approval followed by ratification, acceptance or approval; or
(c) accession.

Article X

1. Ratification, acceptance, approval or accession shall be effected by the deposit of a formal instrument to that effect with the Secretary-General of the Organization.

2. Any instrument of ratification, acceptance. approval or accession deposited after the entry into force of an amendment to the present Convention with respect to all existing Parties or after the completion of all measures required for the entry into force of the amendment with respect to those Parties shall be deemed to apply to the Convention as modified by the amendment.

Article XI

1. The present Convention shall enter into force on the ninetieth day following the date on which Governments of fifteen States have either signed it without reservation as to ratification, acceptance or approval or have deposited instruments of ratification, acceptance, approval or accession with the Secretary-General of the Organization.

2. For each State which subsequently ratifies, accepts, approves or accedes to it the present Convention shall come into force on the ninetieth day after deposit by such State of the appropriate instrument.

Article XII

1. The present Convention may be denounced by any Party at any time after the date on which the Convention comes into force for that State.
2. Denunciation shall be effected by the deposit of an instrument with the Secretary-General of the Organization.
3. A denunciation shall take effect one year, or such longer period as may be specified in the instrument of denunciation, after its deposit with the Secretary-General of the Organization.

Article XIII

1. The United Nations where it is the administering authority for a territory or any State Party to the present Convention responsible for the international relations of a territory, shall as soon as possible consult with the appropriate authorities of such territories or take such other measures as may be appropriate in order to extend the present Convention to that territory and may at any time by notification in writing to the Secretary-General of the Organization declaring that the present Convention shall extend to such territory.

2. The present Convention shall, from the late of receipt of the notification from such other date as may be specified in the notification, extend to the territory named therein.

3. The United Nations, or any Party which has made a declaration under paragraph 1 of this Article may at any time after the date on which the Convention has been so extended to any territory declare by notification in writing to the Secretary-General of the Organization that the present Convention shall cease to extend to any such territory named in the notification.

4. The present Convention shall cease to extend to any territory mentioned in such notification one year, or such longer period as may be specified therefore after the date of receipt of the notification by the Secretary-General of the Organization.

Article XIV

1. A Conference for the purpose of revising or amending the present Convention may be convened by the Organization.
2. The Organization shall convene a Conference of the States Parties to the present Convention for revising or amending the present Convention at the request of not less than one-third of the Parties.

Article XV

1. The present Convention shall be deposited with the Secretary-General the Organization.

2. The Secretary-General of the Organization shall:
   (a) inform all States which have signed or acceded to the Convention or:
      (i) each new signature or deposit of instrument together with the data thereof;
      (ii) the deposit of any instrument of denunciation of this Convention together with the date of the deposit;
      (iii) the extension of the present Convention to any territory under paragraph 1 of Article XIII and of the termination of any such extension under the provisions of paragraph 4 of that Article stating in each case the date on which the present Convention has been or will cease to be so extended;
   (b) transmit certified true copies of the present Convention to all Signatory States and to all States which accede to the present Convention.

Article XVI

As soon as the present Convention comes into force, the text shall be transmitted by the Secretary-General of the Organization to the Secretariat of the United Nations for registration and publication in accordance with Article 102 of the Charter of the United Nations.

Article XVII

The present Convention is established in a single copy in the English and French languages, both texts being equally authentic. Official translations in the Russian and Spanish languages shall be prepared and deposited with the signed original.

IN WITNESS WHEREOF the undersigned* being duly authorized by their respective Governments for that purpose have signed the present Convention.

DONE at Brussels this twenty-ninth day of November 1969.

* Signatures omitted.

ANNEX

CHAPTER I. CONCILIATION

Article 1

Provided the Parties concerned do not decide otherwise, the procedure of conciliation shall be in accordance with the rules set out in this Chapter.

Article 2

1. A Conciliation Commission shall be established upon the request of the Party addressed to another in application of Article VIII of the Convention.

2. The request for conciliation submitted by a Party shall consist of a statement of the case together with any supporting documents.

3. If a procedure has been initiated between two Parties, any other Party of nationals or property of which have been affected by the same measures which is a coastal State having taken similar measures, may join in the conciliation procedure by giving written notice to the Parties which have originally initiated the procedure unless either of the latter Parties object to such joins.

Article 3

1. The Conciliation Commission shall be composed of three members: one nominated by the coastal State which took the measures, one nominated by the State the nationals or property of which have been affected by those measured and a third, who shall preside over the Commission and shall be nominated by agreement between the two original members.

2. The Conciliators shall be selected from a list previously drawn up in accordance with the procedure set out in Article 4 below.

3. If within a period of 60 days from the date of receipt of the request for conciliation, the Party to which such request is made has not given notice to the other Party to the controversy of the nomination of the Conciliator for whose selection it is responsible, or if, within a period of 30 days from the date of nomination of the second of the members of the Commission to be designated by the Parties, the first two Conciliators have not been able to designate by common agreement the Chairmen of the Commission, the Secretary-General of the Organization shall upon request of either Party and within a period of 30 days, proceed to the required nomination. The members of the Commission to be nominated shall be selected from the list prescribed in the preceding paragraph.

4. In no case shall the Chairman of the Commission be or have been a national of one of the original Parties to the procedure, whatever the method of the nomination.

Article 4

1. The list prescribed in Article 3 above shall consist of qualified persons designated by the Parties and shall be kept up to date by the Organization. Each Party may designate for inclusion on the list four persons, who shall not necessarily be its nationals. The nominations shall be for periods of six years each and shall be renewable.

2. In the case of the decease or resignation of a person whose name appears on the list, the Party which nominated such person shall be permitted to nominate a replacement for the remainder of the term of office.

Article 5

1. Provided the Parties do not agree otherwise, the Conciliation Commission shall establish its own procedures, which shall in all cases permit a fair hearing. As regards examination, the Commission, unless it unanimously decides otherwise, shall conform with the provisions of Chapter III of The Hague Convention for the Peaceful Settlement of International Disputes of 18 October 1907.

2. The Parties shall be represented before the Conciliation Commission by agents whose duty shall be to act as intermediaries between the Parties and the Commission. Each of the Parties may seek also the assistance of advisers and experts nominated by it for this purpose and may request the hearing of all persons whose evidence the Party considers useful.

3. The Commission shall have the right to request explanations from agents, advisers and experts of the Parties as well as from any persons whom, with the consent of their Governments, it may deem useful to call.

Article 6

Provided the Parties do not agree otherwise, decisions of the Conciliation Commission shall be taken by a majority vote and the Commission shall not pronounce on the substance of the controversy unless all its members are present.

Article 7

The Parties shall facilitate the work of the Conciliation Commission and in particular, in accordance with their legislation, and using all means at their disposal:

(a) provide the Commission with the necessary documents and information;

(b) enable the Commission to enter their territory, to hear witnesses or experts, and to visit the scene.

Article 8

The task of the Conciliation Commission will be to clarify the matter under dispute, to assemble for this purpose all relevant information by means of examination or other means, and to endeavour to reconcile the Parties. Although examining the case, the Commission shall communicate to the Parties a recommendation which appears to the Commission to be appropriate to the matter and shall fix a period of not more than 90 days within which the Parties will be called upon to state whether or not they accept the recommendation.

Article 9

The recommendation shall be accompanied by a statement of reasons for the recommendation does not represent in whole or in part the unanimous opinion of the Commission, any Conciliator shall be entitled to deliver separate opinion.

Article 10

A conciliation shall be deemed unsuccessful if, 90 days after the Parties have been notified of the recommendation, either Party shall not have notified the other Party of its acceptance of the recommendation. Conciliation shall otherwise be deemed unsuccessful if the Commission shall not have been established within the period prescribed in the third paragraph of Article 3 above provided the Parties have not agreed otherwise, if the Commission shall have issued its recommendation within one year from the date on which the Chairman of the Commission was nominated.

Article 11

1. Each member of the Commission shall receive remuneration for his work such remuneration to be fixed by agreement between the Parties which each contribute an equal proportion.
2. Contributions for miscellaneous expenditure incurred by the work of the Commission shall be apportioned in the same manner.

Article 12

The parties to the controversy may at any time during the conciliation procedure decide in agreement to have recourse to a different procedure of settlement of disputes.

CHAPTER II. ARBITRATION

Article 13

1. Arbitration procedure, unless the Parties decide otherwise, shall be in accordance with the rules set out in this Chapter.

2. Where conciliation is unsuccessful, a request for arbitration may only be made within a period of 180 days following the failure of conciliation.

Article 14

The Arbitration Tribunal shall consist of three members: one Arbitrator nominated by the coastal State which took the measures, one Arbitrator nominated by the State the nationals or property of which have been affected by those measures, and another Arbitrator who shall be nominated by agreement between the two first-named, and shall act as its Chairman.

Article 15

1. If, at the end of a period of 60 days from the nomination of the second Arbitrator, the Chairman of the Tribunal shall not have been nominated, the Secretary-General of the Organization upon request of either Party shall within a further period of 60 days proceed to such nomination, selecting from a list of qualified persons previously drawn up in accordance with the provisions of Article 4 above. This list shall be separate from the list of experts prescribed in Article IV of the Convention and from the list of Conciliators prescribed in Article 4 of the present Annex: the name of the same person may, however, appear both on the list of Conciliators and on the list of Arbitrators. A person who has acted as Conciliator in a dispute may not, however, be chosen to act as Arbitrator in the same matter.

2. If, within a period of 60 days from the date of the receipt of the request, one of the Parties shall not have nominated the member of the Tribunal for whose designation it is responsible, the other Party may directly inform the Secretary-General of the Organization who shall nominate the Chairman of the Tribunal within a period of 60 days, selecting him from the list prescribed in paragraph 1 of the present Article.

3. The Chairman of the Tribunal shall, upon nomination, request the Party which has not provided an Arbitrator, to do so in the same manner and under the same conditions. If the Party does not make the required nomination, the Chairman of the Tribunal shall request the Secretary-General of the Organization to make the nomination in the form and conditions prescribed in the preceding paragraph.

4. The Chairman of the Tribunal, if nominated under the provisions of the present Article, shall not be or have been a national of one of the Parties concerned, except with the consent of the other Party or Parties.

5. In the case of the decease or default of an Arbitrator for whose nomination, one of the Parties is responsible, the said Party shall nominate a replacement within a period of 60 days from the date of decease or default. Should the same Party not make the nomination, the arbitration shall proceed under the remaining Arbitrators. In the case of decease or default of the Chairman of the Tribunal, a replacement shall be nominated in accordance with the provisions of Article 14 above, or in the absence of agreement between the members of the Tribunal within a period of 60 days of the decease or default, according to the provisions of the present Article.

Article 16

If a procedure has been initiated between two Parties, any other Party, the nationals or property of which have been affected by the same measures by which is a coastal State having taken similar measures, may join in the arbitration procedure by giving written notice to the Parties which have originally initiated the procedure unless either of the latter Parties object to such joindness.

Article 17

Any Arbitration Tribunal established under the provisions of the present Annex shall decide its own rules of procedure.

Article 18

1. Decisions of the Tribunal both as to its procedure and its place of meeting and as to any controversy laid before it, shall be taken by majority vote of the members; the absence or abstention of one of the members of the Tribunal for whose nomination the Parties were responsible shall not constitute an impediment to the Tribunal reaching a decision. In cases of equal voting, the Chairman shall cast the deciding vote.

2. The Parties shall facilitate the work of the Tribunal and in particular, in accordance with their legislation, and using all means at their disposal:

(a) provide the Tribunal with the necessary documents and information;
(b) enable the Tribunal to enter their territory, to hear witnesses or expertise and to visit the scene.

3. Absence or default of one Party shall not constitute an impediment to the procedure.

Article 19

1. The award of the Tribunal shall be accompanied by a statement of reason. It shall be final and without appeal. The Parties shall immediately comply with the award.

2. Any controversy which may arise between the Parties as regards interpretation and execution of the award may be submitted by either Party for judgment to the Tribunal which made the award, or, if it is not available, to another Tribunal constituted for this purpose in the same manner as the original Tribunal.

International Convention for the Prevention of Pollution from Ships, 1973

THE PARTIES TO THE CONVENTION,

BEING CONSCIOUS of the need to preserve the human environment in general and the marine environment in particular,

RECOGNIZING that deliberate, negligent or accidental release of oil and other harmful substances from ships constitutes a serious source of pollution,

RECOGNIZING ALSO the importance of the International Convention for the Prevention of Pollution of the Sea by Oil, 1954, as being the first multilateral instrument to be concluded with the prime objective of protecting the environment, and appreciating the significant contribution which that Convention has made in preserving the seas and coastal environment from pollution,

DESIRING to achieve the complete elimination of intentional pollution of the marine environment by oil and other harmful substances and the minimization of accidental discharge of such substances,

CONSIDERING that this object may best be achieved by establishing rules not limited to oil pollution having a universal purport,

HAVE AGREED as follows:

Article 1
General obligations under the Convention

(1) The Parties to the Convention undertake to give effect to the provisions of the present Convention and those Annexes thereto by which they are bound, in order to prevent the pollution of the marine environment by the discharge of harmful substances or effluents containing such substances in contravention of the Convention.

(2) Unless expressly provided otherwise, a reference to the present Convention constitutes at the same time a reference to its Protocols and to the Annexes.

Article 2
Definitions

For the purposes of the present Convention, unless expressly provided otherwise:

(1) *Regulation* means the regulations contained in the Annexes to the present Convention.

(2) *Harmful substance* means any substance which, if introduced into the sea, is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea, and includes any substance subject to control by the present Convention.

(3) (a) *Discharge*, in relation to harmful substances or effluents containing such substances, means any release howsoever caused from a ship and includes any escape, disposal, spilling, leaking, pumping, emitting or emptying;

(b) *Discharge* does not include:

(i) dumping within the meaning of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, done at London on 13 November 1972; or

(ii) release of harmful substances directly arising from the exploration, exploitation and associated offshore processing of sea-bed mineral resources; or

(iii) release of harmful substances for purposes of legitimate scientific research into pollution abatement or control.

(4) *Ship* means a vessel of any type whatsoever operating in the marine environment and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft and fixed or floating platforms.

(5) *Administration* means the Government of the State under whose authority the ship is operating. With respect to a ship entitled to fly a flag of any State, the Administration is the Government of that State. With respect to fixed or floating platforms engaged in exploration and exploitation of the sea-bed and subsoil thereof adjacent to the coast over which the coastal State exercises sovereign rights for the purposes of exploration and exploitation of their natural resources, the Administration is the Government of the coastal State concerned.

(6) *Incident* means an event involving the actual or probable discharge into the sea of a harmful substance, or effluents containing such a substance.

(7) *Organization* means the Inter-Governmental Maritime Consultative Organization.*

* The name of the Organization was changed to "International Maritime Organization" by virtue of amendments to the Organization's Convention which entered into force on 22 May 1982.

Article 3
Application

(1) The present Convention shall apply to:
(a) ships entitled to fly the flag of a Party to the Convention; and
(b) ships not entitled to fly the flag of a Party but which operate under the authority of a Party.

(2) Nothing in the present article shall be construed as derogating from or extending the sovereign rights of the Parties under international law over the sea-bed and subsoil thereof adjacent to their coasts for the purposes of exploration and exploitation of their natural resources.

(3) The present Convention shall not apply to any warship, naval auxiliary or other ship owned or operated by a State and used, for the time being, only on government non-commercial service. However, each Party shall ensure by the adoption of appropriate measures not impairing the operations or operational capabilities of such ships owned or operated by it, that such ships act in a manner consistent, so far as is reasonable and practicable, with the present Convention.

Article 4
Violation

(1) Any violation of the requirements of the present Convention shall be prohibited and sanctions shall be established therefore under the law of the Administration of the ship concerned wherever the violation occurs. If the Administration is informed of such a violation and is satisfied that sufficient evidence is available to enable proceedings to be brought in respect of the alleged violation, it shall cause such proceedings to be taken as soon as possible, in accordance with its law.

(2) Any violation of the requirements of the present Convention within the jurisdiction of any Party to the Convention shall be prohibited and sanctions shall be established therefore under the law of that Party. Whenever such a violation occurs, that Party shall either:
(a) cause proceedings to be taken in accordance with its law; or
(b) furnish to the Administration of the ship such information and evidence as may be in its possession that a violation has occurred.

(3) Where information or evidence with respect to any violation of the present Convention by a ship is furnished to the Administration of that ship, the Administration shall promptly inform the Party which has furnished the information or evidence, and the Organization, of the action taken.

(4) The penalties specified under the law of a Party pursuant to the present article

shall be adequate in severity to discourage violations of the present Convention and shall be equally severe irrespective of where the violations occur.

Article 5
Certificates and special rules on inspection of ships

(1) Subject to the provisions of paragraph (2) of the present article a certificate issued under the authority of a Party to the Convention in accordance with the provisions of the regulations shall be accepted by the other Parties and regarded for all purposes covered by the present Convention as having the same validity as a certificate issued by them.

(2) A ship required to hold a certificate in accordance with the provisions of the regulations is subject, while in the ports or offshore terminals under the jurisdiction of a Party, to inspection by officers duly authorized by that Party. Any such inspection shall be limited to verifying that there is on board a valid certificate, unless there are clear grounds for believing that the condition of the ship or its equipment does not correspond substantially with the particulars of that certificate. In that case, or if the ship does not carry a valid certificate, the Party carrying out the inspection shall take such steps as will ensure that the ship shall not sail until it can proceed to sea without presenting an unreasonable threat of harm to the marine environment. That Party may, however, grant such a ship permission to leave the port or offshore terminal for the purpose of proceeding to the nearest appropriate repair yard available.

(3) If a Party denies a foreign ship entry to the ports or offshore terminals under its jurisdiction or takes any action against such a ship for the reason that the ship does hot comply with the provisions of the present Convention, the Parry shall immediately inform the consul or diplomatic representative of the Party whose flag the ship is entitled to fly, or if this is not possible, the Administration of the ship concerned. Before denying entry or taking such action the Party may request consultation with the Administration of the ship concerned. Information shall also be given to the Administration when a ship does not carry a valid certificate in accordance with the provisions of the regulations.

(4) With respect to the ship of non-Parties to the Convention, Parties shall apply the requirements of the present Convention as may be necessary to ensure that no more favourable treatment is given to such ships.

Article 6
Detection of violations and enforcement of the Convention

(1) Parties to the Convention shall co-operate in the detection of violations and the enforcement of the provisions of the present Convention, using all appropriate and

practicable measures of detection and environmental monitoring, adequate procedures for reporting and accumulation of evidence.

(2) A ship to which the present Convention applies may, in any port or offshore terminal of a Party, be subject to inspection by officers appointed or authorized by that Party for the purpose of verifying whether the ship has discharged any harmful substances in violation of the provisions of the regulations. If an inspection indicates a violation of the Convention, a report shall be forwarded to the Administration for any appropriate action.

(3) Any Party shall furnish to the Administration evidence, if any, that the ship has discharged harmful substances or effluents containing such substances in violation of the provisions of the regulations. If it is practicable to do so, the competent authority of the former Party shall notify the master of the ship of the alleged violation.

(4) Upon receiving such evidence, the Administration so informed shall investigate the matter, and may request the other Party to furnish further or better evidence of the alleged contravention. If the Administration is satisfied that sufficient evidence is available to enable proceedings to be brought in respect of the alleged violation, it shall cause such proceedings to be taken in accordance with its law as soon as possible. The Administration shall promptly inform the Party which has reported the alleged violation, as well as the Organization, of the action taken.

(5) A Party may also inspect a ship to which the present Convention applies when it enters the ports or offshore terminals under its jurisdiction, if a request for an investigation is received from any Party together with sufficient evidence that the ship has discharged harmful substances or effluents containing such substances in any place. The report of such investigation shall be sent to the Party requesting it and to the Administration so that the appropriate action may be taken under the present Convention.

Article 7
Undue delay to ships

(1) All possible efforts shall be made to avoid a ship being unduly detained or delayed under articles 4, 5 or 6 of the present Convention.

(2) When a ship is unduly detained or delayed under articles 4, 5 or 6 of the present Convention, it shall be entitled to compensation for any loss or damage suffered.

Article 8
Reports on incidents involving harmful substances

(1) A report of an incident shall be made without delay to the fullest extent possible in accordance with the provisions of Protocol I to the present Convention.

(2) Each Party to the Convention shall:
   (a) make all arrangements necessary for an appropriate officer or agency to receive and process all reports on incidents; and
   (b) notify the Organization with complete details of such arrangements for circulation to other Parties and Member States of the Organization.

(3) Whenever a Party receives a report under the provisions of the present article, that Party shall relay the report without delay to:
   (a) the Administration of the ship involved; and
   (b) any other State which may be affected.

(4) Each Party to the Convention undertakes to issue instructions to its maritime inspection vessels and aircraft and to other appropriate services, to report to its authorities any incident referred to in Protocol I to the present Convention. That Party shall, if it considers it appropriate, report accordingly to the Organization and to any other Party concerned.

Article 9
Other treaties and interpretation

(1) Upon its entry into force, the present Convention supersedes the International Convention for the Prevention of Pollution of the Sea by Oil, 1954, as amended, as between Parties to that Convention.

(2) Nothing in the present Convention shall prejudice the codification and development of the law of the sea by the United Nations Conference on the Law of the Sea convened pursuant to resolution 2750 C(XXV) of the General Assembly of the United Nations nor the present or future claims and legal views of any State concerning the law of the sea and the nature and extent of coastal and flag State jurisdiction.

(3) The term "jurisdiction" in the present Convention shall be construed in the light of international law in force at the time of application or interpretation of the present Convention.

Article 10
Settlements of disputes

Any dispute between two or more Parties to the Convention concerning the interpretation or application of the present Convention shall, if settlement by negotiation between the Parties involved has not been possible, and if these Parties do not otherwise agree, be submitted upon request of any of them to arbitration as set out in Protocol II to the present Convention.

Article 11
Communication of information

(1) The Parties to the Convention undertake to communicate to the Organization:
- (a) the text of laws, orders, decrees and regulations and other instruments which have been promulgated on the various matters within the scope of the present Convention;
- (b) a list of non-governmental agencies which are authorized to act on their behalf in matters relating to the design, construction and equipment of ships carrying harmful substances in accordance with the provisions of the regulations;*
- (c) a sufficient number of specimens of their certificates issued under the provisions of the regulations;
- (d) a list of reception facilities including their location, capacity and available facilities and other characteristics;
- (e) official reports or summaries of official reports in so far as they show the results of the application of the present Convention; and
- (f) an annual statistical report, in a form standardized by the Organization, of penalties actually imposed for infringement of the present Convention.

(2) The Organization shall notify Parties of the receipt of any communications under the present article and circulate to all Parties any information communicated to it under subparagraphs (1)(b) to (f) of the present article.

Article 12
Casualties to ships

(1) Each Administration undertakes to conduct an investigation of any casualty occurring to any of its ships subject to the provisions of the regulations if such casualty has produced a major deleterious effect upon the marine environment.

(2) Each Party to the Convention undertakes to supply the Organization with information concerning the findings of such investigation, when it judges that such information may assist in determining what changes in the present Convention might be desirable.

Article 13
Signature, ratification, acceptance, approval and accession

(1) The present Convention shall remain open for signature at the Headquarters of the Organization from 15 January 1974 until 31 December 1974 and shall there-

* The text of this subparagraph is replaced by that contained in article III of the 1978 Protocol (see Page 20).

after remain open for accession. States may become Parties to the present Convention by:

(a) signature without reservation as to ratification, acceptance or approval; or
(b) signature subject to ratification, acceptance or approval, followed by ratification, acceptance or approval; or
(c) accession.

(2) Ratification, acceptance, approval or accession shall be effected by the deposit of an instrument to that effect with the Secretary-General of the Organization.

(3) The Secretary-General of the Organization shall inform all States which have signed the present Convention or acceded to it of any signature or of the deposit of any new instrument of ratification, acceptance, approval or accession and the date of its deposit.

Article 14
Optional annexes

(1) A State may at the time of signing, ratifying, accepting, approving or acceding to the present Convention declare that it does not accept any one or all of Annexes III, IV and V (hereinafter referred to as "Optional Annexes") of the present Convention. Subject to the above, Parties to the Convention shall be bound by any Annex in its entirety.

(2) A State which has declared that it is not bound by an Optional Annex may at any time accept such Annex by depositing with the Organization an instrument of the kind referred to in article 13(2).

(3) A State which makes a declaration under paragraph (1) of the present article in respect of an Optional Annex and which has not subsequently accepted that Annex in accordance with paragraph (2) of the present article shall not be under any obligation nor entitled to claim any privileges under the present Convention in respect of matters related to such Annex and all references to Parties in the present Convention shall not include that State in so far as matters related to such Annex are concerned.

(4) The Organization shall inform the States which have signed or acceded to the present Convention of any declaration under the present article as well as the receipt of any instrument deposited in accordance with the provisions of paragraph (2) of the present article.

Article 15
Entry in force

(1) The present Convention shall enter into force 12 months after the date on which

not less than 15 States, the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world's merchant shipping, have become parties to it in accordance with article 13.

(2) An Optional Annex shall enter into force 12 months after the date on which the conditions stipulated in paragraph (1) of the present article have been satisfied in relation to that Annex.

(3) The Organization shall inform the States which have signed the present Convention or acceded to it of the date on which it enters into force and of the date on which an Optional Annex enters into force in accordance with paragraph (2) of the present article.

(4) For States which have deposited an instrument of ratification, acceptance. approval or accession in respect of the present Convention or any Optional Annex after the requirements for entry into force thereof have been met but prior to the date of entry into force, the ratification, acceptance, approval or accession shall take effect on the date of entry into force of the Convention or such Annex or three months after the date of deposit of the instrument whichever is the later date.

(5) For States which have deposited an instrument of ratification, acceptance, approval or accession after the date on which the Convention or an Optional Annex entered into force, the Convention or the Optional Annex shall become effective three months after the date of deposit of the instrument.

(6) After the date on which all the conditions required under article 16 to bring an amendment to the present Convention or an Optional Annex into force have been fulfilled, any instrument of ratification, acceptance, approval or accession deposited shall apply to the Convention or Annex as amended.

Article 16
Amendments

(1) The present Convention may be amended by any of the procedures specified in the following paragraphs.

(2) Amendments after consideration by the Organization:
- (a) any amendment proposed by a Party to the Convention shall be submitted to the Organization and circulated by its Secretary General to all Members of the Organization and all Parties at least six months prior to its consideration;
- (b) any amendment proposed and circulated as above shall be submitted to an appropriate body by the Organization for consideration;
- (c) Parties to the Convention, whether or not Members of the Organization, shall be entitled to participate in the proceedings of the appropriate body;

(d) amendments shall be adopted by a two-thirds majority of only the Parties to the Convention present and voting;

(e) if adopted in accordance with subparagraph (d) above, amendments shall be communicated by the Secretary-General of the Organization to all the Parties to the Convention for acceptance;

(f) an amendment shall be deemed to have been accepted in the following circumstances:

(i) an amendment to an article of the Convention shall be deemed to have been accepted on the date on which it is accepted by two thirds of the Parties, the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world's merchant fleet;

(ii) an amendment to an Annex to the Convention shall be deemed to have been accepted in accordance with the procedure specified in subparagraph (f)(iii) unless the appropriate body, at the time of its adoption, determines that the amendment shall be deemed to have been accepted on the date on which it is accepted by two thirds of the Parties, the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world's merchant fleet. Nevertheless, at any time before the entry into force of an amendment to an Annex to the Convention, a Party may notify the Secretary-General of the Organization that its express approval will be necessary before the amendment enters into force for it. The latter shall bring such notification and the date of its receipt to the notice of Parties;

(iii) an amendment to an appendix to an Annex to the Convention shall be deemed to have been accepted at the end of a period to be determined by the appropriate body at the time of its adoption, which period shall be not less than ten months, unless within that period an objection is communicated to the Organization by not less than one third of the Parties or by the Parties the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world's merchant fleet whichever condition is fulfilled;

(iv) an amendment to Protocol I to the Convention shall be subject to the same procedures as for the amendments to the Annexes to the Convention, as provided for in subparagraphs (f)(ii) or (f)(iii) above;

(v) an amendment to Protocol II to the Convention shall be subject to the same procedures as for the amendments to an article of the Convention, as provided for in subparagraph (f)(i) above;

(g) the amendment shall enter into force under the following conditions:

(i) in the case of an amendment to an article of the Convention, to Protocol II, or to Protocol I or to an Annex to the Convention not under

the procedure specified in subparagraph (f)(iii), the amendment accepted in conformity with the foregoing provisions shall enter into force six months after the date of its acceptance with respect to the Parties which have declared that they have accepted it;

(ii) in the case of an amendment to Protocol I, to an appendix to an Annex or to an Annex to the Convention under the procedure specified in subparagraph (f)(iii), the amendment deemed to have been accepted in accordance with the foregoing conditions shall enter into force six months after its acceptance for all the Parties with the exception of those which, before that date, have made a declaration that they do not accept it or a declaration under subparagraph (f)(ii), that their express approval is necessary.

(3) Amendment by a Conference:

(a) Upon the request of a Party, concurred in by at least one third of the Parties, the Organization shall convene a Conference of Parties to the Convention to consider amendments to the present Convention.

(b) Every amendment adopted by such a Conference by a two-thirds majority of those present and voting of the Parties shall be communicated by the Secretary-General of the Organization to all Contracting Parties for their acceptance.

(c) Unless the Conference decides otherwise, the amendment shall be deemed to have been accepted and to have entered into force in accordance with the procedures specified for that purpose in paragraph (2)(f) and (g) above.

(4) (a) In the case of an amendment to an Optional Annex, a reference in the present article to a "Party to the Convention" shall be deemed to mean a reference to a Party bound by that Annex.

(b) Any Party which has declined to accept an amendment to an Annex shall be treated as a non-Party only for the purpose of application of that amendment.

(5) The adoption and entry into force of a new annex shall be subject to the same procedures as for the adoption and entry into force of an amendment to an article of the Convention.

(6) Unless expressly provided otherwise, any amendment to the present Convention made under this article, which relates to the structure of a ship, shall apply only to ships for which the building contract is placed, or in the absence of a building contract, the keel of which is laid, on or after the date on which the amendment comes into force.

(7) Any amendment to a Protocol or to an Annex shall relate to the substance of that Protocol or Annex and shall be consistent with the articles of the present Convention.

(8) The Secretary-General of the Organization shall inform all Parties of any amendments which enter into force under the present article, together with the date on which each such amendment enters into force.

(9) Any declaration of acceptance or of objection to an amendment under the present article shall be notified in writing to the Secretary-General of the Organization. The latter shall bring such notification and the date of its receipt to the notice of the Parties to the Convention.

Article 17
Promotion of technical co-operation

The Parties to the Convention shall promote, in consultation with the Organization and other international bodies, with assistance and coordination by the Executive Director of the United Nations Environment Programme, support for those Parties which request technical assistance for:

(a) the training of scientific and technical personnel;
(b) the supply of necessary equipment and facilities for reception and monitoring;
(c) the facilitation of other measures and arrangements to prevent or mitigate pollution of the marine environment by ships; and
(d) the encouragement of research; preferably within the countries concerned, so furthering the aims and purposes of the present Convention.

Article 18
Denunciation

(1) The present Convention or any Optional Annex may be denounced by any Parties to the Convention at any time after the expiry of five years from the date on which the Convention or such Annex enters into force for that Party.

(2) Denunciation shall be effected by notification in writing to the Secretary-General of the Organization who shall inform all the other Parties Of any such notification received and of the date of its receipt as well as the date on which such denunciation takes effect.

(3) A denunciation shall take effect 12 months after receipt of the notification of denunciation by the Secretary-General of the Organization or after the expiry of any other longer period which may be indicated in the notification.

Article 19
Deposit and registration

(1) The present convention shall be deposited with the Secretary General of the

Organization who shall transmit certified true copies thereof to all States which have signed the present Convention or acceded to it.

(2) As soon as the present Convention enters into force, the text shall be transmitted by the Secretary-General of the Organization to the Secretary-General of the United Nations for registration and publication, in accordance with Article 102 of the Charter of the United Nations.

Article 20
Languages

The present Convention is established in a single copy in the English, French, Russian and Spanish languages, each text being equally authentic. Official translations in the Arabic, German, Italian and Japanese languages shall be prepared and deposited with the signed original.

IN WITNESS WHEREOF the undersigned* being duly authorized by their respective Governments for that purpose have signed the present Convention.

DONE AT LONDON this second day of November, one thousand nine hundred and seventy-three.

* Signatures omitted.

Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973

THE PARTIES TO THE PRESENT PROTOCOL,

RECOGNIZING the significant contribution which can be made by the International Convention for the Prevention of Pollution from Ships, 1973, to the protection of the marine environment from pollution from ships,

RECOGNIZING ALSO the need to improve further the prevention and control of marine pollution from ships, particularly oil tankers,

RECOGNIZING FURTHER the need for implementing the Regulations for the Prevention of Pollution by Oil contained in Annex I of that Convention as early and as widely as possible,

ACKNOWLEDGING HOWEVER the need to defer the application of Annex II of that Convention until certain technical problems have been satisfactorily resolved,

CONSIDERING that these objectives may best be achieved by the conclusion of a Protocol relating to the International Convention for the Prevention of Pollution from Ships, 1973,

HAVE AGREED as follows:

Article I
General obligations

(1) The Parties to the present Protocol undertake to give effect to the provisions of
   (a) the present Protocol and the Annex hereto which shall constitute an integral part of the present Protocol; and
   (b) the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as "the Convention"), subject to the modifications and additions set out in the present Protocol.

2 The provisions of the Convention and the present Protocol shall be read and interpreted together as one single instrument.

(3) Every reference to the present Protocol constitutes at the same time a reference to the Annex hereto.

Article II
Implementation of Annex II of the Convention

(1) Notwithstanding the provisions of article 14(1) of the Convention, the Parties to the present Protocol agree that they shall not be bound by the provisions of Annex II of the Convention for a period of three years from the date of entry into force of the present Protocol or for such longer period as may be decided by a two-thirds majority of the Parties to the present Protocol in the Marine Environment Protection Committee (hereinafter referred to as "the Committee") of the Inter-Governmental Maritime Consultative Organization (hereinafter referred to as "the Organization").*

(2) During the period specified in paragraph 1 of this article, the Parties to the present Protocol shall not be under any obligations nor entitled to claim any privileges under the Convention in respect of matters relating to Annex II of the Convention and all reference to Parties in the Convention shall not include the Parties to the present Protocol in so far as matters relating to that Annex are concerned.

Article III
Communication of information

The text of article 11(1)(b) of the Convention is replaced by the following.

> "a list of nominated surveyors or recognized organizations which are authorized to act on their behalf in the administration of matters relating to the design, construction, equipment and operation of ships carrying harmful substances in accordance with the provisions of the regulations for circulation to the Parties for information of their officers. The Administration shall therefore notify the Organization of the specific responsibilities and conditions of the authority delegated to nominated surveyors or recognized organizations."

Article IV
Signature, ratification, acceptance, approval and accession

(1) The present Protocol shall be open for signature at the Headquarters of the Organization from 1 June 1978 to 31 May 1979 and shall thereafter remain open for accession. States may become Parties to the present Protocol by:

(a) signature without reservation as to ratification, acceptance or approval; or

* The name of the Organization was changed to "International Maritime Organization" by virtue of amendments to the Organization's Convention which entered into force on 22 May 1982.

(b) signature, subject to ratification, acceptance or approval, followed by ratification, acceptance or approval; or
(c) accession.

(2) Ratification, acceptance, approval or accession shall be effected by the deposit of an instrument to that effect with the Secretary-General of the Organization.

Article V
Entry into force

(1) The present Protocol shall enter into force 12 months after the date on which not less than IS States, the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world's merchant shipping, have become Parties to it in accordance with article IV of the present Protocol.

(2) Any instrument of ratification, acceptance, approval or accession deposited after the date on which the present Protocol enters into force shall take effect three months after the date of deposit.

(3) After the date on which an amendment to the present Protocol is deemed to have been accepted in accordance with article 16 of the Convention, any instrument of ratification, acceptance, approval or accession deposited shall apply to the present Protocol as amended.

Article VI
Amendments

The procedures set out in article 16 of the Convention in respect of amendments to the articles, an Annex and an appendix to an Annex of the Convention shall apply respectively to amendments to the articles, the Annex and an appendix to the Annex of the present Protocol.

Article VII
Denunciation

(1) The present Protocol may be denounced by any Party to the present Protocol at any time after the expiry of live years from the date on which the Protocol enters into force for that Party.

(2) Denunciation shall be effected by the deposit of an instrument of denunciation with the Secretary-General of the Organization.

(3) A denunciation shall take effect 12 months after receipt of the notification by the Secretary-General of the Organization or after the expiry of any other longer period which may be indicated in the notification.

Article VIII
Depositary

(1) The present Protocol shall be deposited with the Secretary-General of the Organization (hereinafter referred to as "the Depositary").

(2) The Depositary shall:
- (a) inform all States which have signed the present Protocol or acceded thereto of.
  - (i) each new signature or deposit of an instrument of ratification, acceptance, approval or accession, together with the date thereof;
  - (ii) the date of entry into force of the present Protocol;
  - (iii) the deposit of any instrument of denunciation of the present Protocol together with the date on which it was received and the date on which the denunciation takes effect;
  - (iv) any decision made in accordance with article 11(1) of the present Protocol;
- (b) transmit certified true copies of the present Protocol to all States which have signed the present Protocol or acceded thereto.

(3) As soon as the present Protocol enters into force, a certified true copy thereof shall be transmitted by the Depositary to the Secretariat of the United Nations for registration and publication in accordance with Article 102 of the Charter of the United Nations.

Article IX
Languages

The present Protocol is established in a single original in the English, French, Russian and Spanish languages, each text being equally authentic. Official translations in the Arabic, German, Italian and Japanese languages shall be prepared and deposited with the signed original.

IN WITNESS WHEREOF the undersigned* being duly authorized by their respective Governments for that purpose have signed the present Protocol.

DONE AT LONDON this seventeenth day of February one thousand nine hundred and seventy-eight.

* Signatures omitted.

Regulation 13F
Prevention of oil pollution in the event of collision or stranding

SEE INTERPRETATION 4.6

(1) This regulation shall apply to oil tankers of 600 tons deadweight and above:
- (a) or which the building contract is placed on or after 6 July 1993, or
- (b) in the absence of a building contract, the keels of which are laid or which are at a similar stage of construction on or after 6 January 1994, or
- (c) the delivery of which is on or after 6 July 1996, or
- (d) which have undergone a major conversion:
  - (i) for which the contract is placed after 6 July 1993; or
  - (ii) in the absence of a contract, the construction work of which is begun after 6 January 1994; or
  - (iii) which is completed after 6 July 1996.

SEE INTERPRETATION 1.2

(2) Every oil tanker of 5,000 tons deadweight and above shall:
- (a) in lieu of regulation 33E, as applicable, comply with the requirements of paragraph (3) unless it is subject to the provisions of paragraphs (4) and (5); and
- (b) comply, if applicable, with the requirements of paragraph (6).

(3) The entire cargo tank length shall be protected by ballast tanks or spaces other than cargo and fuel oil tanks as follows:

(a) *Wing tanks or spaces*
Wing tanks or spaces shall extend either for the full depth of the ship's side or from the top of the double bottom to the uppermost deck, disregarding a rounded gunwale where fitted. They shall be arranged such that the cargo tanks are located inboard of the moulded line of the side shell plating, nowhere less than the distance w which, as shown in figure 1, is measured at any cross-section at right angles to the side shell, as specified below:

$$w = 0.5 + \frac{DW}{20,000} \text{ (m) or}$$

w = 2.0 m, whichever is the lesser.

The minimum value of w = 1.0 m.

(b) *Double bottom tanks or spaces*
At any cross-section the depth of each double bottom tank or space shall be such that the distance h between the bottom of the cargo tanks and the

moulded line of the bottom shell plating measured at right angles to the bottom shell plating as shown in figure 1 is not less than specified below:

$h = B/15$ (m) or

$h = 2.0$ m, whichever is the lesser.
The minimum value of $h = 1.0$ m.

(c) *Turn of the bilge area or at locations without a clearly defined turn of the bilge*
When the distances h and w are different, the distance w shall have preference at levels exceeding $1.5h$ above the baseline as shown in figure 1.

(d) *The aggregate capacity of ballast tanks*
On crude oil tankers of 20,000 tons deadweight and above and product carriers of 30,000 tons deadweight and above, the aggregate capacity of wing tanks, double bottom tanks, forepeak tanks and afterpeak tanks shall not be less than the capacity of segregated ballast tanks necessary to meet the requirements of regulation 13. Wing tanks or spaces and double bottom tanks used to meet the requirements of regulation 13 shall be located as uniformly as practicable along the cargo tank length. Additional segregated ballast capacity provided for reducing longitudinal hull girder bending stress, trim, etc., may be located anywhere with the ship.

SEE INTERPRETATION 4.12

(e) *Suction wells in cargo tanks*
Suction wells in cargo tanks may protrude into the double bottom below the boundary line defined by the distance h provided that such wells are as small as practicable and the distance between the well bottom and bottom shell plating is not less than $0.5h$.

(f) *Ballast and cargo piping*
Ballast piping and other piping such as sounding and vent piping to ballast tanks shall not pass through cargo tanks. Cargo piping and similar piping to cargo tanks shall not pass through ballast tanks. Exemptions to this requirement may be granted for short lengths of piping, provided that they are completely welded or equivalent.

(4) (a) Doub le bottom tanks or spaces as required by paragraph (3)(b) may be dispensed with, provided that the design of the tanker is such that the cargo and vapour pressure exerted on the bottom shell plating forming a single boundary between the cargo and the sea does not exceed the external hydrostatic water pressure, as expressed by the following formula:

$$f \times h_c \times \rho_c \times g + 100\Delta p \leq d_n \times \rho_s \times g$$

where:

h_c = height of cargo in contact with the bottom shell plating in metres

ρ_c = maximum cargo density in t/m^3

d_n = minimum operating draught under any expected loading condition in metres

ρ_n = density of seawater in t/m^3

Δp = maximum set pressure of pressure/vacuum valve provided for the cargo tank in bars

f = safety factor = 1.1

g = standard acceleration of gravity (9.81 m/s^2).

(b) Any horizontal partition necessary to fulfil the above requirements shall be located at a height of not less than $B/6$ or 6 m, whichever is the lesser, but not more than $0.6D$, above the baseline where D is the moulded depth amidships.

(c) The location of wing tanks or spaces shall be as defined in paragraph (3)(a) except that, below a level $1.5h$ above the baseline where h is as defined in paragraph (3)(b), the cargo tank boundary line may be vertical down to the bottom plating as shown in figure 2.

(5) Other methods of design and construction of oil tankers may also be accepted as alternative's to the requirements prescribed in paragraph (3), provided that such methods ensure at least the same level of protection against oil pollution in the event of collision or stranding and are approved in principle by the Marine Environment Protection Committee based on guidelines developed by the Organization.*

(6) For oil tankers of 20,000 toils deadweight and above the damage assumptions prescribed in regulation 25(2)(b) shall be supplemented by the following assumed bottom raking damage:

(a) longitudinal extent:
  (i) ships of 75,000 tons deadweight and above: $0.6L$ measured from the forward perpendicular;
  (ii) ships of less than 75,000 tons deadweight: $0.4L$ measured from the forward perpendicular;
(b) transverse extent: $B/3$ anywhere in the bottom;
(c) vertical extent: breach of the outer hull.

(7) Oil tankers of less than 5,000 tons deadweight shall:

* Refer to the Interim guidelines for the approval of alternative methods of design and construction of oil tankers under regulation 13F(5) of Annex I of MARPOL 73/78 adopted by the Marine Environment Protection Committee of the Organization by resolution MEPC.66(37); see appendix 8 to Unified Interpretations of Annex I, page 182.

(a) at least be fitted with double bottom tanks or spaces having such a depth that the distance I specified in paragraph (3)(b) complies with the following:

$$h = B/15 \text{ (m)}$$

with a minimum value of $h = 0.76$ m;

in the turn of the bilge area and at locations without a clearly defined turn of the bilge, the cargo tank boundary line shall run parallel to the line of the midship flat bottom as shown in figure 3; and

(b) be provided with cargo tanks so arranged that the capacity of each cargo tank does not exceed 700 m^3 unless wing tanks or spaces are arranged in accordance with paragraph (3)(a) complying with the following:

$$w = 0.4 + \frac{2.4DW}{20,000} \text{ (m)}$$

(8) Oil shall not be carried in any space extending forward of a collision bulkhead located in accordance with regulation II-1/11 of the International Convention for the Safety of Life at Sea, 1974, as amended. An oil tanker that is not required to have a collision bulkhead in accordance with that regulation shall not carry oil in any space extending forward of the transverse plane perpendicular to the centreline that is located as if it were a collision bulkhead located in accordance with that regulation.

(9) In approving the design and construction of oil tankers to be built in accordance with the provisions of this regulation Administrations shall have due regard to the general safety aspects including the need for the maintenance and inspections of wing and double bottom tanks or spaces.

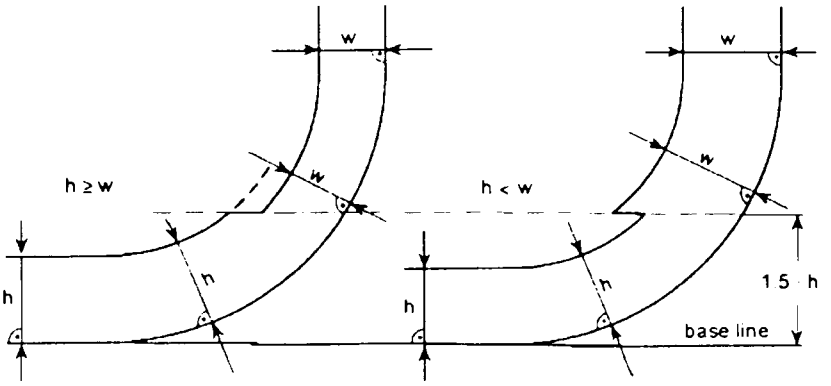


Fig. 1. Cargo tank boundary lines for the purpose of paragraph (3).

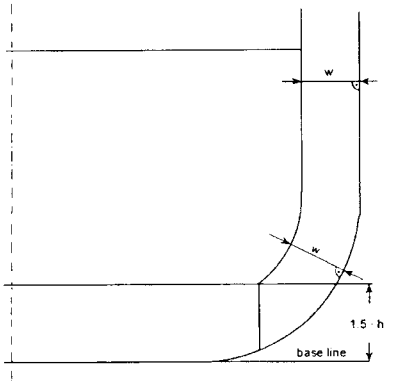


Fig. 2. Cargo tank boundary hue's for the purpose of paragraph (4).

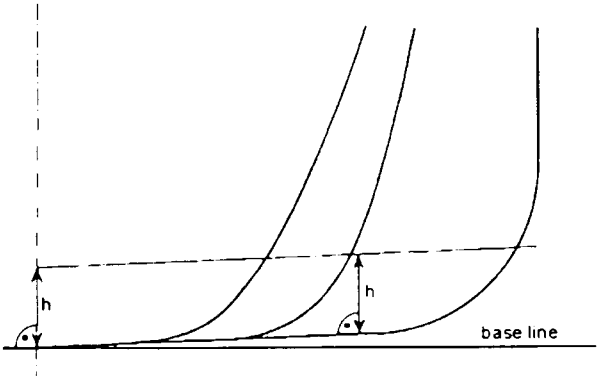


Fig. 3. Cargo tank boundary lines for the purpose of paragraph (7).

Regulation 13G
Prevention of oil pollution in the event of collision or standing – Measures for existing tankers

SEE INTERPRETATION 4.6

Measures for existing tankers

(1) This regulation shall:
  (a) apply to crude oil tankers of 20,000 tons deadweight and above and to product carriers of 30,000 tons deadweight and above, which are contracted, the keels of which are laid, or which are delivered before the dates specified in regulation 13F(1) of this Annex; and
  (b) not apply to oil tankers complying with regulation 13F of this Annex, which are contracted, the keels of which are laid, or are delivered before the dates specified in regulation 13F(1) of this Annex; and
  (c) not apply to oil tankers covered by subparagraph (a) above which comply with regulation 13F(3)(a) and (b) or 13F(4) or 13F(5) of this Annex, except that the requirement for minimum distances between the cargo tank boundaries and the ship side and bottom plating need not be met in all respects. In that event, the side protection distances shall not be less than those specified in the International Bulk Chemical Code for type 2 cargo tank location and the bottom protection distances shall comply with regulation 13E(4)(b) of this Annex.

(2) The requirements of this regulation shall take effect as from 6 July 1995.

(3) (a) An oil tanker to which this regulation applies shall be subject to an enhanced programme of inspections during periodical, intermediate and annual surveys, the scope and frequency of which shall at least comply with the guidelines developed by the Organization.*
  (b) An oil tanker over five years of age to which this regulation applies shall have on board, available to the competent authority of any Government of a State Party to the present Convention, a complete file of the survey reports, including the results of all scantling measurement required, as well as the statement of structural work carried out.
  (c) This file shall be accompanied by a condition evaluation report containing conclusions On the structural condition of the ship and its residual scantlings, endorsed to indicate that it has been accepted by or on behalf of

* Refer to the Guidelines on the Enhanced Programme of Inspections during Surveys of Bulk Carriers and Oil Tankers adopted by the Organization by resolution A.744(18), as amended; see IMO sales publication IMO-180E.

the flag Administration. This file and condition evaluation report shall be prepared in a standard form as contained in the guidelines developed by the Organization.

(4) An oil tanker not meeting the requirements of a new oil tanker as defined in regulation 1(26) of this Annex shall comply with the requirements of regulation 13F of this Annex not later than 25 years after its date of delivery, unless wing tanks or double bottom space not used for the carriage of oil and meeting the width and height requirements of regulation 13E(4), cover at least 300% of L_t for the full depth of the ship on each side or at least 300% of the projected bottom shell area within the length L_t, where L_t is as defined in regulation 13E(2), in which case compliance with regulation 13F is required not later than 30 years after its date of delivery.

SEE INTERPRETATION 4.13

(5) An oil tanker meeting the requirements of a new oil tanker as defined in regulation 1(26) of this Annex shall comply with the requirements of regulation 13F of this Annex not later than 30 years after its date of delivery.

(6) Any new ballast and load conditions resulting from the application paragraph (4) of this regulation shall be subject to approval of the Administration which shall have regard, in particular, to longitudinal and local strength, intact stability and, if applicable, damage stability.

(7) Other structural or operational arrangements such as hydrostatically balanced loading may be accepted as alternatives to the requirements prescribed in paragraph (4), provided that such alternatives ensure at least the same level of protection against oil pollution in the event of collision or stranding and are approved by the Administration based on guidelines developed by the Organization.*,**

* Refer to the Guidelines for approval of alternative structural or operational arrangements as called for in regulation 13G(7) of Annex I of MARPOL 73/78 adopted by the Marine Environment Protection Committee of the Organization by resolution MEPC.64(36); see appendix 7 to Unified Interpretations of Annex I, page 176.

** The 1999 Amendments to regulation 13G and 2b add a new regulation 16 (Shipboard marine pollution emergency plan for noxious liquid substances) to Annex II (not included in this Appendix).

Chapter IV – Prevention of pollution arising from an oil pollution incident

Regulation 26
Shipboard oil pollution emergency plan

(1) Every oil tanker of 150 tons gross tonnage and above and every ship other than an oil tanker of 400 tons gross tonnage and above shall carry on board a shipboard oil pollution emergency plan approved by the Administration. In the case of ships built before 4 April 1993 this requirement shall apply 24 months after that date.

SEE INTERPRETATION 12.1 AND 12.2

(2) Such a plan shall be in accordance with guidelines* developed by the Organization and written in the working language of the master and officers. The plan shall consist at least of:

(a) the procedure to be followed by the master or other persons having charge of the ship to report an oil pollution incident, as required in article 8 and Protocol I of the present Convention, based on the guidelines developed by the Organization;**
(b) the list of authorities or persons to be contacted in the event of an oil pollution incident;
(c) a detailed description of the' action to be taken immediately by persons on board to reduce or control the discharge of oil following the incident; and
(d) the procedures and point of contact on the ship for coordinating shipboard action with national and local authorities in combating the pollution.

* Refer to the Guidelines for the development of shipboard oil pollution emergency plans adopted by the Marine Environment Protection Committee of the Organization by resolution MEPC.54(32); see IMO sales publication IMO-586E.

** Refer to the General principles for ship reporting systems and ship reporting requirements, including Guidelines for reporting incidents involving dangerous goods, harmful substances and/or marine pollutants adopted by the Organization by resolution A.648(16); see IMO sales publication IMO-516E.

OPRC CONVENTION

INTERNATIONAL CONVENTION
ON OIL POLLUTION PREPAREDNESS,
RESPONSE AND CO-OPERATION, 1990

including
Final Act of the Conference
and
Attachment (resolutions 1 to 10)



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Foreword

By resolution A.674(16) of 19 October 1989, the Assembly of the International Maritime Organization (IMO), recognizing the severity of recent oil pollution incidents, decided to convene an international conference on oil pollution preparedness and response.

The Organization's Marine Environment Protection Committee (MEPC) was requested by the Assembly to develop, for consideration by such conference, an international convention on oil pollution preparedness and response which would provide the framework for international cooperation for combating major oil pollution incidents, taking into account the experience gained within existing regional arrangements dealing with these matters.

Pursuant to this directive, the draft international convention and relevant resolutions were considered by a working group established by MEPC at its twenty-ninth session in March 1990 and a Preparatory Meeting in May 1990 which agreed on a draft convention on oil pollution preparedness and response and related draft resolutions.

In accordance with the decision of the Assembly, the diplomatic conference was convened by IMO and held in London at its Headquarters from 19 to 30 November 1990. In addition to the Final Act, the Conference adopted the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990. The Conference also adopted ten resolutions which are contained in the Attachment to the Final Act.

This publication reproduces the texts of the Final Act of the Conference, including its Attachment, and the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990. Pursuant to resolution 1 adopted by the Conference, the Secretariat has included as footnotes references to the instruments and other documents developed by IMO under articles 3, 4, 5 and 6 of the Convention. It should be noted that regulation 26 of Annex I of MARPOL 73/78 referred to in the footnote to article 3(1) is the subject of a proposed amendment to MARPOL 73/78 which it is anticipated will be adopted by the Marine Environment Protection Committee at its thirty-first session in July 1991.

Contents

Final Act of the Conference on International Co-operation on Oil Pollution Preparedness and Response

International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990

Attachment to the Final Act – resolutions adopted by the Conference:

Resolution 1 – References to instruments and other documents developed by the International Maritime Organization under articles of the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990

Resolution 2 – Implementation of the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 pending its entry into force

Resolution 3 – Early implementation of the provisions of article 12 of the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990

Resolution 4 – Implementation of the provisions of article 6 of the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990

Resolution 5 – Establishment of oil pollution combating equipment stockpiles

Resolution 6 – Promotion of technical assistance

Resolution 7 – Development and implementation of a training programme for oil pollution preparedness and response

Resolution 8 – Improving salvage services

Resolution 9 – Co-operation between States and insurers

Resolution 10 – Expansion of the scope of the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 to include hazardous and noxious substances

INTERNATIONAL CONVENTION ON OIL POLLUTION PREPAREDNESS, RESPONSE AND CO-OPERATION, 1990

THE PARTIES TO THE PRESENT CONVENTION,

CONSCIOUS of the need to preserve the human environment in general and the marine environment in particular,

RECOGNIZING the serious threat posed to the marine environment by oil pollution incidents involving ships, offshore units, sea ports and oil handling facilities,

MINDFUL of the importance of precautionary measures and prevention in avoiding oil pollution in the first instance, and the need for strict application of existing international instruments dealing with maritime safety and marine pollution prevention, particularly the International Convention for the Safety of Life at Sea, 1974, as amended, and the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, as amended, and also the speedy development of enhanced standards for the design, operation and maintenance of ships carrying oil, and of offshore units,

MINDFUL ALSO that, in the event of an oil pollution incident, prompt and effective action is essential in order to minimize the damage which may result from such an incident,

EMPHASIZING the importance of effective preparation for combating oil pollution incidents and the important role which the oil and shipping industries have in this regard,

RECOGNIZING FURTHER the importance of mutual assistance and international co-operation relating to matters including the exchange of information respecting the capabilities of States to respond to oil pollution incidents, the preparation of oil pollution contingency plans, the exchange of reports of incidents of significance which may affect the marine environment or the coastline and related interests of States, and research and development respecting means of combating oil pollution in the marine environment,

TAKING ACCOUNT of the "polluter pays" principle as a general principle of international environmental law.

TAKING ACCOUNT ALSO of the importance of international instruments on liability and compensation for oil pollution damage, including the 1969 International

Convention on Civil Liability for Oil Pollution Damage (CLC); and the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (FUND); and the compelling need for early entry into force of the 1984 Protocols to the CLC and FUND Conventions,

TAKING ACCOUNT FURTHER of the importance of bilateral and multilateral agreements and arrangements including regional conventions and agreements,

BEARING IN MIND the relevant provisions of the United Nations Convention on the Law of the Sea, in particular of its part XII,

BEING AWARE of the need to promote international co-operation and to enhance existing national, regional and global capabilities concerning oil pollution preparedness and response, taking into account the special needs of the developing countries and particularly small island States,

CONSIDERING that these objectives may best be achieved by the conclusion of an International Convention on Oil Pollution Preparedness, Response and Co-operation,

HAVE AGREED as follows:

ARTICLE 1
General provisions

(1) Parties undertake, individually or jointly, to take all appropriate measures in accordance with the provisions of this Convention and the Annex thereto to prepare for and respond to an oil pollution incident.

(2) The Annex to this Convention shall constitute an integral part of the Convention and a reference to this Convention constitutes at the same time a reference to the Annex.

(3) This Convention shall not apply to any warship, naval auxiliary or other ship owned or operated by a State and used, for the time being, only on government non-commercial service. However, each Party shall ensure by the adoption of appropriate measures not impairing the operations or operational capabilities of such ships owned or operated by it, that such ships act in a manner consistent, so far as is reasonable and practicable, with this Convention.

ARTICLE 2
Definitions

For the purposes of this Convention:

(1) *Oil* means petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products.

(2) *Oil pollution incident* means an occurrence or series of occurrences having the same origin, which results or may result in a discharge of oil and which poses or may pose a threat to the marine environment, or to the coastline or related interests of one or more States, and which requires emergency action or other immediate response.

(3) *Ship* means a vessel of any type whatsoever operating in the marine environment and includes hydrofoil boats, air-cushion vehicles, submersibles, and floating craft of any type.

(4) *Offshore unit* means any fixed or floating offshore installation or structure engaged in gas or oil exploration, exploitation or production activities, or loading or unloading of oil.

(5) *Sea ports and oil handling facilities* means those facilities which present a risk of an oil pollution incident and includes, *inter alia*, sea ports, oil terminals, pipelines and other oil handling facilities.

(6) *Organization* means the International Maritime Organization.

(7) *Secretary-General* means the Secretary-General of the Organization.

ARTICLE 3
Oil pollution emergency plans

(1) (a) Each Party shall require that ships entitled to fly its flag have on board a shipboard oil pollution emergency plan as required by and in accordance with the provisions adopted by the Organization for this purpose.*

(b) A ship required to have on board an oil pollution emergency plan in accordance with subparagraph (a) is subject, while in a port or at an offshore terminal under the jurisdiction of a Party, to inspection by officers duly authorized by that Party, in accordance with the practices provided for in existing international agreements** or its national legislation.

(2) Each Party shall require that operators of offshore units under its jurisdiction have oil pollution emergency plans, which are co-ordinated with the national system established in accordance with article 6 and approved in accordance with procedures established by the competent national authority.

* The "provisions adopted by the Organization . . . " refers to regulation 26 of Annex I of the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto, as amended (MARPOL 73/78).

** "Existing international agreements" refers to articles 5 and 7 of MARPOL 73/78.

(3) Each Party shall require that authorities or operators in charge of such sea ports and oil handling facilities under its jurisdiction as it deems appropriate have oil pollution emergency plans or similar arrangements which are co-ordinated with the national system established in accordance with article 6 and approved in accordance with procedures established by the competent national authority.

ARTICLE 4

Oil pollution reporting procedures

(1) Each Party shall:

(a) require masters or other persons having charge of ships flying its flag and persons having charge of offshore units under its jurisdiction to report without delay any event on their ship or offshore unit involving a discharge or probable discharge of oil:

(i) in the case of a ship, to the nearest coastal State;

(ii) in the case of an offshore unit, to the coastal State to whose jurisdiction the unit is subject;

(b) require masters or other persons having charge of ships flying its flag and persons having charge of offshore units under its jurisdiction to report without delay any observed event at sea involving a discharge of oil or the presence of oil:

(i) in the case of a ship, to the nearest coastal State;

(ii) in the case of an offshore unit, to the coastal State to whose jurisdiction the unit is subject;

(c) require persons having charge of sea ports and on handling facilities under its jurisdiction to report without delay any event involving a discharge or probable discharge of oil or the presence of oil to the competent national authority;

(d) instruct its maritime inspection vessels or aircraft and other appropriate services or officials to report without delay any observed event at sea or at a sea port or oil handling facility involving a discharge of oil or the presence of oil to the competent national authority or, as the case may be, to the nearest coastal State;

(e) request the pilots of civil aircraft to report without delay any observed event at sea involving a discharge of oil or the presence of oil to the nearest coastal State.

(2) Reports under paragraph (1)(a)(i) shall be made in accordance with the requirements developed by the Organization* and based on the guidelines and general principles adopted by the Organization. Reports under paragraph (1)(a)(ii), (b), (c)

* The "requirements developed by the organization" refers to article 8 and Protocol I of NIARPOL 73/78.

and (d) shall be made in accordance with the guidelines and general principles adopted by the Organization to the extent applicable.*

ARTICLE 5

Action on receiving on oil pollution report

(1) Whenever a Party receives a report referred to in article 4 or pollution information provided by other sources, it shall.

(a) assess the event to determine whether it is an oil pollution incident;

(b) assess the nature, extent and possible consequences of the oil pollution incident; and

(c) then, without delay inform all States whose interests are affected or likely to be affected by such oil pollution incident, together with

(i) details of its assessments and any action it as intends to take, to deal with the incident, and

(ii) further information as appropriate,

until the action taken to respond to the incident has been concluded or until joint action has been decided by such States.

(2) When the severity of such oil pollution incident so justifies, the Party should provide the Organization directly or, as appropriate, through the relevant regional organization or arrangements with the information referred to in paragraph (1)(b) and (c).

(3) When the severity of such oil pollution incident so justifies, other States affected by it are urged to inform the Organization directly or, as appropriate, through the relevant regional organizations or arrangements of their assessment of the extent of the threat to their interests and any action taken or intended.

(4) Parties should use, in so far as practicable, the oil pollution reporting system developed by the Organization** when exchanging information and communicating with other States and with the Organization.

* "Guidelines and general principles adopted by the Organization" refers to "General principles for ship reporting systems and ship reporting requirements, including guidelines for reporting incidents involving dangerous goods, harmful substances and/or marine pollutants" adopted by the Organization by resolution A.648(16). (Secretariat note: For ease of reference see IMO publication *Provisions concerning the Reporting of Incidents Involving Harmful Substances under* MARPOL 73/78.)

** The "oil pollution reporting system developed by the Organization" is contained in the *Manual on Oil Pollution, Section II – Contingency Planning*, appendix 2, developed by the Marine Environment Protection Committee of the Organization.

ARTICLE 6

National and regional systems for preparedness and response

(1) Each Party shall establish a national system for responding promptly and effectively to oil pollution incidents. This system shall include as a minimum:

(a) the designation of:

(i) the competent national authority or authorities with responsibility for oil pollution preparedness and response;

(ii) the national operational contact point or points, which shall be responsible for the receipt and transmission of oil pollution reports as referred to in article 4; and

(iii) an authority which is entitled to act on behalf of the State to request assistance or to decide to render the assistance requested;

(b) a national contingency plan for preparedness and response which includes the organizational relationship of the various bodies involved, whether public or private, taking into account guidelines developed by the Organization.*

(2) In addition, each Party, within its capabilities either individually or through bilateral or multilateral co-operation and, as appropriate, in cooperation with the oil and shipping industries, port authorities and other relevant entities, shall establish:

(a) a minimum level of pre-positioned oil spill combating equipment, commensurate with the risk involved, and programmes for its use;

(b) a programme of exercises for oil pollution response organizations and training of relevant personnel;

(c) detailed plans and communication capabilities for responding to an oil pollution incident. Such capabilities should be continuously available; and

(d) a mechanism or arrangement to co-ordinate the response to an oil pollution incident with, if appropriate, the capabilities to mobilize the necessary resources.

(3) Each Party shall ensure that current information is provided to the Organization, directly or through the relevant regional organization or arrangements, concerning:

(a) the location, telecommunication data and, if applicable, areas of responsibility of authorities and entities referred to in paragraph (1)(a);

(b) information concerning pollution response equipment and expertise in disciplines related to oil pollution response and marine salvage which may be made available to other States, upon request; and

(c) its national contingency plan.

* The "guidelines developed by the Organization" are contained in the *Manual on Oil Pollution, Section II – Contingency Planning*, developed by the Marine Environment Protection Committee of the Organization.

ARTICLE 7

International co-operation in pollution response

(1) Parties agree that, subject to their capabilities and the availability of relevant resources, they will co-operate and provide advisory services, technical support and equipment for the purpose of responding to an oil pollution incident, when the severity of such incident so justifies, upon the request of any Party affected or likely to be affected. The financing of the costs for such assistance shall be based on the provisions set out in the Annex to this Convention.

(2) A Party which has requested assistance may ask the Organization to assist in identifying sources of provisional financing of the costs referred to in paragraph (1).

(3) In accordance with applicable international agreements, each Party shall take necessary legal or administrative measures to facilitate:

(a) the arrival and utilization in and departure from its territory of ships, aircraft and other modes of transport engaged in responding to an oil pollution incident or transporting personnel, cargoes, materials and equipment required to deal with such an incident; and

(b) the expeditious movement into, through, and out of its territory of personnel, cargoes, materials and equipment referred to in subparagraph (a).

ARTICLE 8

Research and development

(1) Parties agree to co-operate directly or, as appropriate, through the Organization or relevant regional organizations or arrangements in the promotion and exchange of results of research and development programmes relating to the enhancement of the state-of-the-art of oil pollution preparedness and response, including technologies and techniques for surveillance, containment, recovery, dispersion, clean-up and otherwise minimizing or mitigating the effects of oil pollution, and for restoration.

(2) To this end, Parties undertake to establish directly or, as appropriate, through the Organization or relevant regional organizations or arrangements, the necessary links between Parties' research institutions.

(3) Parties agree to co-operate directly or through the Organization or relevant regional organizations or arrangements to promote, as appropriate, the holding on a regular basis of international symposia on relevant subjects, including technological advances in oil pollution combating techniques and equipment.

(4) Parties agree to encourage, through the Organization or other competent international organizations, the development of standards for compatible oil pollution combating techniques and equipment.

ARTICLE 9

Technical co-operation

(1) Parties undertake directly or through the Organization and other international bodies, as appropriate in respect of oil pollution preparedness and response, to provide support for those Parties which request technical assistance:

(a) to train personnel;
(b) to ensure the availability of relevant technology, equipment and facilities;
(c) to facilitate other measures and arrangements to prepare for and respond to oil pollution incidents; and
(d) to initiate joint research and development programmes.

(2) Parties undertake to co-operate actively. subject to their national laws, regulations and policies, in the transfer Of technology in respect of oil pollution preparedness and response.

ARTICLE 10

Promotion of bilateral and multilateral co-operation in preparedness and response

Parties shall endeavour to conclude bilateral or multilateral agreements for oil pollution preparedness and response. Copies of such agreements shall be communicated to the Organization which should make them available on request to Parties.

ARTICLE 11

Relation to other conventions and international agreements

Nothing in this Convention shall be construed as altering the rights or obligations of any Party under any other convention or international agreement.

ARTICLE 12

Institutional arrangements

(1) Parties designate the Organization, subject to its agreement and the availability of adequate resources to sustain the activity, to perform the following functions and activities:

(a) information services:
    (i) to receive, collate and disseminate on request the information provided by Parties (see, for example, articles 5(2) and (3), 6(3) and 10) and relevant information provided by other sources; and
    (ii) to provide assistance in identifying sources of provisional financing of costs (see, for example, article 7(2));

(b) education and training:
  (i) to promote training in the field of oil pollution preparedness and response (see, for example, article 9); and
  (ii) to promote the holding of international symposia (see, for example, article 8(3));
(c) technical services:
  (i) to facilitate co-operation in research and development (see, for example, articles 8(1), (2) and (4) and 9(1)(d));
  (ii) to provide advice to States establishing national or regional response capabilities; and
  (iii) to analyse the information provided by Parties (see, for example, articles 5(2) and (3), 6(3) and 8(1)) and relevant information provided by other sources and provide advice or information to States;
(d) technical assistance:
  (i) to facilitate the provision of technical assistance to States establishing national or regional response capabilities; and
  (ii) to facilitate the provision of technical assistance and advice, upon the request of States faced with major oil pollution incidents.

(2) In carrying out the activities specified in this article, the Organization shall endeavour to strengthen the ability of States individually or through regional arrangements to prepare for and combat oil pollution incidents, drawing upon the experience of States, regional agreements and industry arrangements and paying particular attention to the needs of developing countries.

(3) The provisions of this article shall be implemented in accordance with a programme developed and kept under review by the Organization.

ARTICLE 13
Evaluation of the Convention

Parties shall evaluate within the Organization the effectiveness of the Convention in the light of its objectives, particularly with respect to the principles underlying co-operation and assistance.

ARTICLE 14
Amendments

(1) This Convention may be amended by one of the procedures specified in the following paragraphs.

(2) Amendment after consideration by the Organization.

(a) Any amendment proposed by a Party to the Convention shall be submitted to the Organization and circulated by the Secretary-General to all Members of the Organization and all Parties at least six months prior to its consideration.

(b) Any amendment proposed and circulated as above shall be submitted to the Marine Environment Protection Committee of the Organization for consideration.

(c) Parties to the Convention, whether or not Members of the Organization, shall be entitled to participate in the proceedings of the Marine Environment Protection Committee.

(d) Amendments shall be adopted by a two-thirds majority of only the Parties to the Convention present and voting.

(e) If adopted in accordance with subparagraph (d), amendments shall be communicated by the Secretary-General to all Parties to the Convention for acceptance.

(f) (i) An amendment to an article or the Annex of the Convention shall be deemed to have been accepted on the date on which it is accepted by two thirds of the Parties.

(ii) An amendment to an appendix shall be deemed to have been accepted at the end of a period to be determined by the Marine Environment Protection Committee at the time of its adoption, which period shall not be less than ten months, unless within that period an objection is communicated to the Secretary-General by not less than one third of the Parties.

(g) (i) An amendment to an article or the Annex of the Convention accepted in conformity with subparagraph (f)(i) shall enter into force six months after the date on which it is deemed to have been accepted with respect to the Parties which have notified the Secretary-General that they have accepted it.

(ii) An amendment to an appendix accepted in conformity with subparagraph (f)(ii) shall enter into force six months after the date on which it is deemed to have been accepted with respect to all Parties with the exception of those which, before that date, have objected to it. A Party may at any time withdraw a previously communicated objection by submitting a notification to that effect to the Secretary-General.

(3) Amendment by a Conference:

(a) Upon the request of a Party, concurred with by at least one third of the Parties, the Secretary-General shall convene a Conference of Parties to the Convention to consider amendments to the Convention.

(b) An amendment adopted by such a Conference by a two-thirds majority of those Parties present and voting shall be communicated by the Secretary-General to all Parties for their acceptance.

(c) Unless the Conference decides otherwise, the amendment shall be deemed to have been accepted and shall enter into force in accordance with the procedures specified in paragraph (2)(f) and (g).

(4) The adoption and entry into force of an amendment constituting an addition of an Annex or an appendix shall be subject to the procedure applicable to an amendment to the Annex.

(5) Any Party which has not accepted an amendment to an article or the Annex under paragraph (2)(f)(i) or an amendment constituting an addition of an Annex or an appendix under paragraph (4) or has communicated an objection to an amendment to an appendix under paragraph (2)(f)(ii) shall be treated as a non-Party only for the purpose of the application of such amendment. Such treatment shall terminate upon the submission of a notification of acceptance under paragraph (2)(f)(i) or withdrawal of the objection under paragraph (2)(g)(ii).

(6) The Secretary-General shall inform all Parties of any amendment which enters into force under this article, together with the date on which the amendment enters into force.

(7) Any notification of acceptance of, objection to, or withdrawal of objection to, an amendment under this article shall be communicated in writing to the Secretary-General who shall inform Parties of such notification and the date of its receipt.

(8) An appendix to the Convention shall contain only provisions of a technical nature.

ARTICLE 15

Signature, ratification, acceptance, approval and accession

(1) This Convention shall remain open for signature at the Headquarters of the Organization from 30 November 1990 until 29 November 1991 and shall thereafter remain open for accession. Any State may become Party to this Convention by:

(a) signature without reservation as to ratification, acceptance or approval; or

(b) signature subject to ratification, acceptance or approval, followed by ratification, acceptance or approval; or

(c) accession.

(2) Ratification, acceptance approval or accession shall be effected by the deposit of an instrument to that effect with the Secretary-General.

ARTICLE 16
Entry into force

(1) This Convention shall enter into force twelve months after the date on which not less than fifteen States have either signed it without reservation as to ratification, acceptance or approval or have deposited the requisite instruments of ratification. acceptance approval or accession in accordance with article 15.

(2) For States which have deposited an instrument of ratification, acceptance approval or accession in respect of this Convention after the requirements for entry into force thereof have been met but prior to the date of entry into force, the ratification, acceptance, approval or accession shall take effect on the date of entry into force of this Convention or three months after the date of deposit of the instrument, whichever is the later date.

(3) For States which have deposited an instrument of ratification, acceptance, approval or accession after the date on which this Convention entered into force, this Convention shall become effective three months after the date of deposit of the instrument.

(4) After the date on which an amendment to this Convention is deemed to have been accepted under article 14, any instrument of ratification, acceptance. approval or accession deposited shall apply to this Convention as amended.

ARTICLE 17
Denunciation

(1) This Convention may be denounced by any Party at any time after the expiry of five years from the date on which this Convention enters into force for that Party.

(2) Denunciation shall be effected by notification in writing to the Secretary-General.

(3) A denunciation shall take effect twelve months after receipt of the notification of denunciation by the Secretary-General or after the expiry of any longer period which may be indicated in the notification.

ARTICLE 18
Depositary

(1) This Convention shall be deposited with the Secretary-General.

(2) The Secretary-General shall:
   (a) inform all States which have signed this Convention or acceded thereto of:
      (i) each new signature or deposit of an instrument of ratification, acceptance, approval or accession, together with the date thereof;

(ii) the date of entry into force of this Convention; and
(iii) the deposit of any instrument of denunciation of this Convention together with the date on which it was received and the date on which the denunciation takes effect;

(b) transmit certified true copies of this Convention to the Governments of all States which have signed this Convention or acceded thereto.

(3) As soon as this Convention enters into force, a certified true copy thereof shall be transmitted by the depositary to the Secretary-General of the United Nations for registration and publication in accordance with Article 102 of the Charter of the United Nations.

ARTICLE 19

Languages

This Convention is established in a single original in the Arabic, Chinese, English, French, Russian and Spanish languages, each text being equally authentic.

IN WITNESS WHEREOF the undersigned*, being duly authorized by their respective Governments for that purpose, have signed this Convention.

DONE AT London this thirtieth day of November one thousand nine hundred and ninety.

* Signatures omitted.

ANNEX

REIMBURSEMENT OF COSTS OF ASSISTANCE

(1) (a) Unless an agreement concerning the financial arrangements governing actions of Parties to deal with oil pollution incidents has been concluded on a bilateral or multilateral basis prior to the oil pollution incident, Parties shall bear the costs of their respective actions in dealing with pollution in accordance with subparagraph (i) or subparagraph (ii).

(i) If the action was taken by one Party at the express request of another Party, the requesting Party shall reimburse to the assisting Party the cost of its action. The requesting Party may cancel its request at any time, but in that case it shall bear the costs already incurred or committed by the assisting Party.

(ii) If the action was taken by a Party on its own initiative, this Party shall bear the costs of its action.

(b) The principles laid down in subparagraph (a) shall apply unless the Parties concerned otherwise agree in any individual case.

(2) Unless otherwise agreed. the costs of action taken by a Party at the request of another Party shall be fairly calculated according to the law and current practice of the assisting Party concerning the reimbursement of such costs.

(3) The Party requesting assistance and the assisting Party shall, where appropriate, co-operate in concluding any action in response to a compensation claim. To that end, they shall give due consideration to existing legal regimes. Where the action thus concluded does not permit full compensation for expenses incurred in the assistance operation, the Party requesting assistance may ask the assisting Party to waive reimbursement of the expenses exceeding the sums compensated or to reduce the costs which have been calculated in accordance with paragraph (2). It may also request a postponement of the reimbursement of such costs. In considering such a request, assisting Parties shall give due consideration to the needs of the developing countries.

(4) The provisions of this Convention shall not be interpreted as in any way prejudicing the rights of Parties to recover from third parties the costs of actions to deal with pollution or the threat of pollution under other applicable provisions and rules of national and international law. Special attention shall be paid to the 1969 International Convention on Civil Liability for Oil Pollution Damage and the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage or any subsequent amendment to those Conventions.

RESOLUTIONS ADOPTED BY THE CONFERENCE

Resolution 1

References to instruments and other documents developed by the International Maritime Organization under articles of the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990

THE CONFERENCE,

HAVING ADOPTED the International Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (the OPRC Convention).

RECOGNIZING that the measures introduced by the OPRC Convention take into account the provisions of other important conventions developed by the International Maritime Organization. in particular the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, as amended (MARPOL 73/78),

RECOGNIZING ALSO the need for the OPRC Convention to supplement and not to duplicate the important provisions adopted by, or under the auspices of, the Organization, such as those contained in MARPOL 73/78, guidelines and manuals,

NOTING that articles 3, 4, 5 and 6 of the OPRC Convention in particular refer to certain provisions of NIARPOL 73/78 and other documents developed by the Organization,

1. ADOPTS the list containing references to the instruments and other documents developed by the Organization under the relevant articles of the OPRC Convention, as set out in the annex to this resolution:

2. INVITES the Marine Environment Protection Committee of the Organization to keep the list up to date;

3. REQUESTS the Secretary-General of the Organization to include these references, updated as necessary, in future editions of the publications of the OPRC Convention in the form of footnotes to the relevant articles.

ANNEX

REFERENCES IN THE OPRC CONVENTION

Article 3(1)(a)

The provisions adopted by the Organization refers to regulation 26 of Annex I of MARPOL 73/78.

Article 3(1)(b)

Existing international agreements refers to articles 5 and 7 of MARPOL 73/78.

Article 4(2)

The requirements developed by the Organization refers to article 8 and Protocol I of MARPOL 73/78.

Guidelines and general principles adopted by the Organization refers to "General principles for ship reporting systems and ship reporting requirements, including guidelines for reporting incidents involving dangerous goods, harmful substances and/or marine pollutants" adopted by the Organization by resolution A.648(16).

Article 5(4)

The oil pollution reporting system developed by the Organization is contained in the Manual on Oil Pollution, Section II – Contingency Planning, appendix 2, developed by the Marine Environment Protection Committee of the Organization.

Article 6(1)(b)

Guidelines developed by the Organization are contained in the *Manual on Oil Pollution, Section II – Contingency Planning*, developed by the Marine Environment Protection Committee of the Organization.

Resolution 2

Implementation of the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 pending its entry into force

THE CONFERENCE,

HAVING ADOPTED the International Convention on Oil Pollution Preparedness. Response and Co-operation, 1990 (the OPRC Convention),

RECOGNIZING the continuing risk of a major oil pollution incident and the serious environmental consequences which may arise therefrom,

CONVINCED of the importance of co-operation among States in the exchange of information and assistance respecting oil pollution preparedness and response.

MINDFUL of the particular vulnerability of those countries which do not have ready access to information and advice on oil pollution preparedness and response.

RECOGNIZING FURTHER that it is desirable for each country at risk from oil pollution incidents to establish a national system for combating oil pollution,

DESIRING that the provisions of the OPRC Convention should become effective as soon as possible so as to facilitate international co-operation in oil pollution preparedness and response,

1. CALLS UPON all States, including those that have not participated in this Conference, to sign and to become Parties to the OPRC Convention and to implement its provisions as soon as possible,

2. URGES all States to establish, as soon as and to the extent possible, national systems for combating oil pollution;

3. URGES FURTHER all States, pending the entry into force of the OPRC Convention for them, to co-operate among themselves and with the International Maritime Organization, as appropriate, in exchanging oil pollution combating information and in facilitating prompt assistance in the event of a major oil pollution incident.

Resolution 3

Early implementation of the provisions of article 12 of the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990

THE CONFERENCE,

HAVING ADOPTED the International Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (the OPRC Convention),

NOTING the provisions of resolution A.448(XI) of the Assembly of the International Maritime Organization on regional arrangements for combating major incidents or threats of marine pollution, and further Assembly resolutions on technical assistance in the field of protection of the marine environment (A.349(IX), A.677(16)),

NOTING ALSO, in particular, that article 12 of the OPRC Convention by which the Parties designated IMO, subject to its agreement and the availability of adequate

resources to sustain the activity, to carry out certain functions and activities and to meet certain objectives of the OPRC Convention,

NOTING FURTHER the importance of taking account of the experience gained within regional agreements on combating marine pollution as referred to in Assembly resolution A.674(16),

RECOGNIZING the importance of early implementation of the objectives of article 12 of the OPRC Convention,

1. INVITES the Secretary-General of the Organization, pending the entry into force of the OPRC Convention. to initiate the early implementation of functions and activities in order to meet the objectives in article 12(1)(a) and (b) of the OPRC Convention within available resources;

2. INVITES the Organization to provide a forum for discussion of experiences gained within regional conventions and agreements concerning combating oil pollution incidents;

3. REQUESTS the Secretary-General to present to the Organization, within one year of this Conference, a programme which indicates the way in which the Organization contemplates carrying out the duties mentioned in this Convention, and which would include such elements as re-allocating available resources, examining and developing alternative organizational arrangements, and determining financial implications and possible sources of support;

4. INVITES FURTHER the Organization to review periodically progress made in implementing article 12 of the OPRC Convention.

Resolution 4

Implementation of the provisions of article 6 of the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990

THE CONFERENCE,

HAVING ADOPTED the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (the OPRC Convention),

RECOGNIZING the importance of the "polluter pays" principle,

NOTING that article 6 of the OPRC Convention provides that the Parties shall establish a national system comprising a contingency plan and shall set up. either indi-

vidually or in co-operation with other Parties, arrangements comprising, in particular, response equipment and a training programme,

BEING AWARE that, in the event of an oil pollution incident, measures taken immediately by the State under threat are essential and are likely, in the initial phase, to be the most effective in protecting its coasts and minimizing the potential damage caused by such an incident,

EMPHASIZING that when international assistance is requested by the State under threat, the dispatch of personnel and equipment may require some time as a result of distance,

EMPHASIZING FURTHER that the effectiveness of assistance depends on measures taken to prepare for response and to train personnel to put into effect the national contingency plan of the State under threat,

BEARING IN MIND that the financial resources available to some developing countries are limited,

RECOGNIZING ALSO that measures taken to prepare for response necessitate specific financial aid, made available for that purpose, for the benefit of the developing countries,

1. INVITES Parties to give due consideration, in their bilateral and multilateral co-operation programmes, and on fair terms, to the needs of the developing countries arising from the implementation of the OPRC Convention;

2. INVITES ALSO the Secretary-General of the Organization to give his support in identifying international bodies that might provide specific sources of financing to assist the developing countries in carrying out the obligations arising from the OPRC Convention.

Resolution 5

Establishment of oil pollution combating equipment stockpiles

THE CONFERENCE,

HAVING ADOPTED the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (the OPRC Convention),

NOTING article 6(2)(a) of the OPRC Convention which provides that each Party shall establish, within its capabilities, either individually, or through bilateral or multilateral co-operation and. as appropriate. in co-operation with the oil and shipping in-

dustries and other entities, a system which includes a minimum level of pre-positioned oil spill combating equipment, and programmes for its use.

NOTING ALSO that one of the fundamental elements of the International Maritime Organization's strategy for the protection of the marine environment is to strengthen the capacity for national and regional action to combat marine pollution and to promote technical co-operation to this end,

RECOGNIZING that in the event of an oil spill or threat thereof, prompt and effective action should be taken initially at the national level to organize and co-ordinate prevention, mitigation and clean-up activities.

RECOGNIZING ALSO that one of the basic principles used for providing funds following pollution damage is the "polluter pays" principle.

RECOGNIZING FURTHER the importance of mutual co-operation and assistance in combating major oil pollution incidents which may be beyond the capability of individual countries and the need to enhance the oil spill combating equipment available in certain regions of the world particularly vulnerable to a major oil pollution incident either because of the high density of vessel traffic or particularly sensitive ecological conditions,

ACKNOWLEDGING the activities of the Organization. in co-operation with donor countries and industry, in establishing oil spill combating equipment stockpiles or centres in areas where developing countries in particular are vulnerable to or at risk from a major oil pollution incident,

INVITES the Secretary-General of the Organisation, in consultation with the Executive Director of the United Nations Environment Programme, to approach the oil and shipping industries with a view to:

(a) encouraging further co-operation in order to assist developing countries to implement article 6 of the OPRC Convention, including an assessment of the need for oil spill combating equipment stockpiles on a regional or subregional basis in addition to those already established;

(b) developing a plan on the establishment of oil spill combating equipment stockpiles on a regional or subregional basis, in order to assist developing countries in implementing article 6(2)(a) of the OPRC Convention.

Resolution 6

Promotion of technical assistance

THE CONFERENCE,

HAVING ADOPTED the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (the OPRC Convention),

NOTING that key elements in the success of any action to combat marine pollution are good administrative organization in the countries concerned in this field and at least a minimum of technical preparation,

BEING AWARE of the difficulties that may be encountered by certain developing countries in establishing such organization and preparation through their own resources,

RECOGNIZING the role played in this connection by the International Maritime Organization, by regional agreements, by bilateral co-operation and by industry programmes,

RECOGNIZING ALSO the contribution made by the Organization's technical co-operation programme, the United Nations Development Programme, the United Nations Environment Programme and national aid agencies in this regard,

NOTING ALSO resolution A.677(16) which invites the Secretary-General of the Organization to undertake on a priority basis an evaluation of problems faced by developing countries with a view to formulating the long-term objectives of the Organization's technical assistance programme in the environmental field, and to report the outcome to the seventeenth session of the Assembly of the Organization,

NOTING FURTHER the convening of an advisory group by the Secretary-General for this purpose,

1. REQUESTS Member States of the Organization, in co-operation with the Organization when appropriate, other interested States, competent international or regional organizations and industry programmes. to strengthen action to assist developing countries especially in:
   (a) the training of personnel,
   (b) ensuring the availability of relevant technologies, equipment and facilities, necessary for oil pollution preparedness and response, so as to enable them to establish at least the minimum structures and resources for combating oil pollution incidents commensurate with the perceived risks of such incidents;

2. REQUESTS ALSO Member States, in co-operation with the Organization when appropriate, other interested States, competent international or regional organizations and industry programmes, to strengthen action to assist developing countries in the initiation of joint research and development programmes;

3. URGES Member States to contribute to such actions without delay, *inter alia*, through bilateral or multilateral co-operation;

4. REQUESTS FURTHER the Organization to re-evaluate the principles underlying co-operation and assistance in articles 7 and 9 of the OPRC Convention in the light of the 1992 United Nations Conference on Environment and Development.

Resolution 7

Development and implementation of a training programme for oil pollution preparedness and response

THE CONFERENCE,

HAVING ADOPTED the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990,

NOTING that a key element in the International Maritime Organization's strategy for protection of the marine environment is the enhancement of the capacity for national and regional action to prevent, control, combat and mitigate marine pollution and to promote technical co-operation to this end,

BEING AWARE that the capability of a State to respond to an oil pollution incident depends on the availability of oil spill combating equipment as well as of trained oil spill response personnel,

RECOGNIZING the role of the Organization in organizing national, regional and global training courses and in developing training aids aimed at providing the necessary technical expertise, in particular for developing countries, in the field of combating incidents of marine pollution,

RECOGNIZING ALSO the role of the World Maritime University and its branches in providing high-level training facilities for personnel, in particular from developing countries,

RECOGNIZING FURTHER the support of the United Nations Development Programme, the United Nations Environment Programme and several Member States of the Organization for the training component of the Organization's technical co-operation programme,

CONSIDERING the need for an increased global effort by all those concerned with the maritime transport of oil and its environmental impact toward the development of a global training programme in oil pollution preparedness and response,

1. INVITES the Secretary-General of the Organization. in co-operation with interested Governments, relevant international and regional organizations and oil and

shipping industries, to endeavour to develop a comprehensive training programme in the field of oil pollution preparedness and response;

2. INVITES ALSO the Marine Environment Protection Committee of the Organization, on the basis of proposals made by the Secretary-General, to consider and endorse, as appropriate, such training programme on oil pollution preparedness and response;

3. INVITES FURTHER Member States of the Organization to endeavour to make available the expertise necessary for the development and implementation of the training programme.

Resolution 8

Improving salvage services

THE CONFERENCE,

HAVING ADOPTED the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990,

CONSIDERING the need to ensure that sufficient salvage capacity is available on a world-wide basis and to appreciate and reward the salvor's preventive function as to marine pollution,

RECALLING that the 1989 International Convention on Salvage, by which incentives for salvors to prevent marine pollution by their salvage operations have been introduced, has not yet entered into force,

NOTING WITH INTEREST that the Third International Conference on the Protection of the North Sea decided on 8 March 1990 to take concerted action within the International Maritime Organization with the aim of ensuring sufficient salvage capacity on a world-wide basis,

RECOGNIZING the expertise and experience of salvors in operating the salvage service efficiently on an international basis,

RECOGNIZING FURTHER the essential role of salvors in response to casualties causing or likely to cause marine pollution,

BEARING IN MIND that there are indications that a considerable percentage of suitable salvage capacity may no longer be available for salvage purposes,

BEING AWARE of the need for sufficient salvage capacity along the main shipping routes of international traffic of oil and other harmful substances,

1. URGES States to ratify or accede to the 1989 International Convention on Salvage as soon as possible;

2. REQUESTS Member States of the Organization to review the salvage capacity available to them and to report to the Organization not later than one year after the Conference on their public and private salvage capabilities which are suitable to carry out salvage operations in order to prevent or minimize damage to the marine environment;

3. REQUESTS Member States whose coasts have been threatened or damaged by marine pollution incidents to report to the Organization on any appropriate measures they have taken to utilize salvage capacities in response to such incidents;

4. REQUESTS the Secretary-General of the Organization to consult the International Salvage Union, salvors, insurers, shipowners and the oil industry on the present and future availability of salvage capacity and to report his findings to the Marine Environment Protection Committee of the Organization.

Resolution 9

Co-operation between States and insurers

THE CONFERENCE,

HAVING ADOPTED the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990,

BEING AWARE of the difficulties that may be encountered by a State affected by a pollution incident in obtaining useful and necessary information for pollution combating,

RECOGNIZING the potential role of insurers' advisers and technical experts in providing such information,

CONVINCED that it is desirable to establish close co-operation between the State that has suffered pollution and the insurers,

REQUESTS insurers' technical experts and advisers to co-operate with States in order to exchange technical information to allow effective response in the event of an oil pollution incident.

Resolution 10

Expansion of the scope of the
International Convention on Oil Pollution
Preparedness, Response and Co-operation, 1990
to include hazardous and noxious substances

THE CONFERENCE,

HAVING ADOPTED the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (the OPRC Convention),

NOTING Article 38(a) of the Convention on the International Maritime Organization relating to the function of the Marine Environment Protection Committee of the Organization concerning the performance of such functions as are or may be conferred upon the Organization by or under international conventions,

RECOGNIZING that pollution of the sea by accidental discharge of hazardous and noxious substances into the waters may threaten the marine environment and the interests of coastal States,

RECOGNIZING ALSO the existence of international instruments dealing with the carriage of hazardous materials and Assembly resolution A.676(16) on the transboundary movement of hazardous wastes,

BEARING IN MIND ALSO that many of the existing regional conventions and agreements on co-operation in combating marine pollution incidents apply both to oil and to other harmful substances,

CONSIDERING it desirable that the scope of the OPRC Convention should be expanded to apply, either in whole or in part, to marine pollution incidents involving hazardous and noxious substances,

CONSIDERING ALSO that it is desirable that, to the extent feasible and where appropriate, the OPRC Convention be applied by Parties thereto to marine pollution incidents involving hazardous and noxious substances other than oil,

BELIEVING that the ways and means of responding to a marine pollution incident involving hazardous and noxious substances are different in certain important respects from those available for oil pollution preparedness and response,

RECOGNIZING FURTHER the ongoing work of the Organization concerning the development of an international legal regime for liability and compensation, in connection with the carriage of hazardous and noxious substances by sea and the need for early adoption of a convention on this subject,

1. INVITES the International Maritime Organization to initiate work to develop an appropriate instrument to expand the scope of the OPRC Convention to apply, in whole or in part, to pollution incidents by hazardous substances other than oil and prepare a proposal to this end;

2. URGES Parties to the OPRC Convention to apply the appropriate provisions of the Convention to the extent feasible and where appropriate to hazardous and noxious substances, pending the adoption and entry into force of an instrument to cover these substances.

Seafarers' Training, Certification
and Watchkeeping Code

STCW Code

International Maritime Organization
London, 1996

Foreword

This part of the publication contains the text of the Seafarers' Training, Certification and Watchkeeping (STCW) Code, which was adopted (resolution 2) by the Conference of Parties to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW Conference) on 7 July 1995 and constitutes attachment 2 to the Final Act of that Conference.

This STCW Code, which cross-refers directly to the articles and regulations of; and should be read in conjunction with, the STCW Convention, contains, in:

- *Part A*, mandatory provisions to which specific reference is made in the annex to the STCW Convention and which give, in detail, the minimum standards required to be maintained by Parties in order to give full and complete effect to the provisions of the STCW Convention; and, in
- *Part B*, recommended guidance to assist Parties to the STCW Convention and those involved in implementing, applying or enforcing its measures to give the STCW Convention full and complete effect in a uniform manner. This part also contains the renumbered sections B-V/a, b and c consequent to the 1997 amendments, which were adopted by resolutions MSC.66(68) and MSC.67(68) and entered into force on 1 January 1999.

The footnotes to the text of the STCW Code, which have been added by the IMO Secretariat, do not form part of that Code and have been inserted for ease of reference. The IMO Secretariat has been requested to update these footnotes as and when appropriate. In all cases the reader must make use of the latest editions of the referenced texts, bearing in mind that such texts may have been revised or superseded by updated material since publication of the Code.

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Attachment 2 to the Final Act of the 1995 STCW Conference

Resolution 2
Adoption of the Seafarers' Training, Certification and Watchkeeping Code

THE CONFERENCE,

HAVING ADOPTED resolution 1 on Adoption of the 1995 amendments to the annex to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978,

RECOGNIZING the importance of establishing detailed mandatory standards of competence and other mandatory provisions necessary to ensure that all seafarers shall be properly educated and trained, adequately experienced, skilled and competent to perform their duties in a manner which provides for the safety of life and property at sea and the protection of the marine environment,

ALSO RECOGNIZING the need to allow for the timely amendment of such mandatory standards and provisions in order to effectively respond to changes in technology, operations, practices and procedures used on board ships,

RECALLING that a large percentage of maritime casualties and pollution incidents are caused by human error,

APPRECIATING that one effective means of reducing the risks associated with human error in the operation of seagoing ships is to ensure that the highest practicable standards of training, certification and competence are maintained in respect of the seafarers who are employed on such ships,

DESIRING to achieve and maintain the highest practicable standards for the safety of life and property at sea and in port and for the protection of the environment,

HAVING CONSIDERED the Seafarers' Training, Certification and Watchkeeping (STCW) Code, comprised of part A – Mandatory standards regarding provisions of the annex to the 1978 STCW Convention, as amended, and part B – Recommended guidance regarding provisions of the 1978 STCW Convention, as amended, proposed and circulated to all Members of the Organization and all Parties to the Convention,

NOTING that regulation I/1, paragraph 2, of the amended annex to the 1978 STCW Convention provides that part A of the STCW Code supplements the regulations annexed to the Convention and that any reference to a requirement in a regulation also constitutes a reference to the corresponding section of part A of the STCW Code,

1. ADOPTS:

   .1 the Seafarers' Training, Certification and Watchkeeping (STCW) Code, part A – Mandatory standards regarding provisions of the annex to the 1978 STCW Convention, as amended, set out in annex l to the present resolution;
   .2 the Seafarers' Training, Certification and Watchkeeping (STCW) Code, part B – Recommended guidance regarding provisions of the 1978 STCW Convention, as amended, and its annex, set out in annex 2 to the present resolution;

2. RESOLVES:

   .1 that the provisions of part A of the STCW Code shall enter into force for each Party to the 1978 STCW Convention, as amended, on the same date and in the same manner as the amendments to that Convention adopted by the Conference;
   .2 to recommend that the guidance contained in part B of the STCW Code should be taken into account by all Parties to the 1978 STCW Convention, as amended, as from the date of entry into force of the amendments to that Convention adopted by the Conference;

3. Invites the International Maritime Organization:

   .1 to keep the provisions of parts A and B of the STCW Code under review and consult, as may be appropriate, with the International Labour Organization, the International Telecommunication Union and the World Health Organization and to bring the need for any future amendment thereto to the attention of the Maritime Safety Committee for consideration and adoption as may be appropriate;
   .2 to communicate this resolution and any future amendment thereto that may be adopted, to the attention of all Parties to the STCW Convention.

Annex 1

Seafarers' Training, Certification and Watchkeeping (STCW) Code

Part A
Mandatory standards regarding provisions of the annex to the STCW Convention

Introduction

1 This part of the STCW Code contains mandatory provisions to which specific reference is made in the annex to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended, hereinafter referred to as the STCW Convention. These provisions give in detail the minimum standards required to be maintained by Parties in order to give full and complete effect to the Convention.

2 Also contained in this part are standards of competence required to be demonstrated by candidates for the issue and revalidation of certificates of competency under the provisions of the STCW Convention. To clarify the linkage between the alternative certification provisions of chapter VII and the certification provisions of chapters II, III and IV, the abilities specified in the standards of competence are grouped as appropriate under the following seven functions:

.1 Navigation
.2 Cargo handling and stowage
.3 Controlling the operation of the ship and care for persons on board
.4 Marine engineering
.5 Electrical, electronic and control engineering
.6 Maintenance and repair
.7 Radiocommunications

at the following levels of responsibility:

.1 Management level
.2 Operational level
.3 Support level

Functions and levels of responsibility are identified by subtide in the tables of standards of competence given in chapters II, III, and IV of this part. The scope of the function at the level of responsibility stated in a subtitle is defined by the abilities listed under it in column 1 of the table. The meaning of "function" and "level of responsibility" is defined in general terms in section A-I/1 below.

3 The numbering of the sections of this part corresponds with the numbering of the regulations contained in the annex to the STCW Convention. The text of the sections may be divided into numbered parts and paragraphs, but such numbering is unique to that text alone.

Chapter I
Standards regarding general provisions

Section A-I/1
Definitions and clarifications

1 The definitions and clarifications contained in article II and regulation I/1 apply equally to the terms used in parts A and B of this Code. In addition, the following supplementary definitions apply only to this Code:

.1 *Standard of competence* means the level of proficiency to be achieved for the proper performance of functions on board ship in accordance with the internationally agreed criteria as set forth herein and incorporating prescribed standards or levels of knowledge, understanding and demonstrated skill;

.2 *Management level* means the level of responsibility associated with:

.2.1 serving as master, chief mate, chief engineer officer or second engineer officer on board a seagoing ship, and

.2.2 ensuring that all functions within the designated area of responsibility are properly performed;

.3 *Operational level* means the level of responsibility associated with:

.3.1 serving as officer in charge of a navigational or engineering watch or as designated duty engineer for periodically unmanned machinery spaces or as radio operator on board a seagoing ship, and

.3.2 maintaining direct control over the performance of all functions within the designated area of responsibility in accordance with proper procedures and under the direction of an individual serving in the management level for that area of responsibility;

.4 *Support level* means the level of responsibility associated with performing assigned tasks, duties or responsibilities on board a seagoing ship under the direction of an individual serving in the operational or management level;

.5 *Evaluation criteria* are the entries appearing in column 4 of the "Specification of Minimum Standard of Competence" tables in part A and provide the means for an assessor to judge whether or not a candidate can perform the related tasks, duties and responsibilities; and

.6 *Independent evaluation* means an evaluation by suitably qualified persons, independent of; or external to, the unit or activity being evaluated, to verify that the administrative and operational procedures at all levels are managed, organized, undertaken and monitored internally in order to ensure their fitness for purpose and achievement of stated objectives.

Section A-I/2
Certificates and endorsements

1 Where, as provided in regulation I/2, paragraph 4, the endorsement required by article VI of the Convention is incorporated in the wording of the certificate itself, the certificate shall be issued in the format shown hereunder, provided that the words "or until the date of expiry of any extension of the validity of this certificate as may be shown overleaf" appearing on the front of the form and the provisions for recording extension of the validity appearing on the back of the form shall be omitted where the certificate is required to be replaced upon its expiry. Guidance on completion of the form is contained in section B-I/2 of this Code.

(Official Seal)

(COUNTRY)

CERTIFICATE ISSUED UNDER THE PROVISIONS OF THE INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING. CERTIFICATION AND WATCHKEEPING FOR SEAFARERS, 1978, AS AMENDED IN 1995

The Government of ..... certifies that ..... has been found duly qualified in accordance with the provisions of regulation ..... of the above Convention, as amended. and has been found competent to perform the following functions, at the levels specified. Subject to any limitation indicated until ..... or until the date of expiry of any extension of the validity of this certificate as may be shown overleaf:

FUNCTION	LEVEL	LIMITATIONS APPLYING (IF ANY)

The lawful holder of this certificate may serve in the following capacity or capacities specified in the applicable safe manning requirements of the Administration:

CAPACITY	LIMITATIONS APPLYING (IF ANY)

Certificate No. ..... issued on .....

(Official Seal)

.....
Signature of duly authorized official

.....
Name of duly authorized official

The original of this certificate must be kept available in accordance with regulation I/2 paragraph 9 of the Convention while serving on a ship.

Date of birth of the holder of the certificate .....

Signature of the holder of the certificate .....

Photograph of the holder of the certificate

The validity of this certificate is hereby extended until	
(Official seal)	..... *Signature of duly authorized official*
Date of revalidation	..... *Name of duly authorized official*
The validity of this certificate is hereby extended until	
(Official seal)	..... *Signature of duly authorized official*
Date of revalidation	..... *Name of duly authorized official*

2 Except as provided in paragraph 1, the form used to attest the issue of a certificate shall be as shown hereunder, provided that the words "or until the date of expiry of any extension of the validity of this endorsement as may be shown overleaf" appearing on the front of the form and the provisions for recording extension of the validity appearing on the back of the form shall be omitted where the endorsement is required to be replaced upon its expiry. Guidance on completion of the form is contained in section B-I/2 of this Code.

(Official Seal)

(COUNTRY)

ENDORSEMENT ATTESTING THE ISSUE OF A CERTIFICATE UNDER THE PROVISIONS OF THE INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING FOR SEAFARERS, 1978, AS AMENDED IN 1995

The Government of ..... certifies that certificate No. ..... has been issued to ..... who has been found duly qualified in accordance with the provisions of regulation .....of the above Convention, as amended, and has been found competent to perform the following functions, at the levels specified, subject to any limitations indicated until ..... or until the date of expiry of any extension of the validity of this endorsement as may be shown overleaf:

FUNCTION	LEVEL	LIMITATIONS APPLYING (IF ANY)

The lawful holder of this certificate may serve in the following capacity or capacities specified in the applicable safe manning requirements of the Administration:

CAPACITY	LIMITATIONS APPLYING (IF ANY)

Endorsement No. ..... issued on .....

(Official Seal)

.....
Signature of duly authorized official

.....
Name of duly authorized official

The original of this certificate must be kept available in accordance with regulation I/2 paragraph 9 of the Convention while serving on a ship.

Date of birth of the holder of the certificate .....

Signature of the holder of the certificate .....

Photograph of the holder of the certificate

The validity of this certificate is hereby extended until	
(Official seal)	..... *Signature of duly authorized official*
Date of revalidation	..... *Name of duly authorized official*
The validity of this certificate is hereby extended until	
(Official seal)	..... *Signature of duly authorized official*
Date of revalidation	..... *Name of duly authorized official*

3 The form used to attest the recognition of a certificate shall be as shown hereunder, except that the words "or until the date of expiry of any extension of the validity of this endorsement as may be shown overleaf" appearing on the front of the form and the provisions for recording extension of the validity appearing on the back of the form shall be omitted where the endorsement is required to be replaced upon its expiry. Guidance on completion of the form is contained in section B-I/2 of this Code.

(Official Seal)

(COUNTRY)

ENDORSEMENT ATTESTING THE RECOGNITION OF A CERTIFICATE UNDER THE PROVISIONS OF THE INTERNATIONAL CONVENTION ON ON STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING FOR SEAFARERS, 1978, AS AMENDED IN 1995

The Government of .....certifies that Certificate No. ..... issued to ..... by or on behalf of the Government of ..... is duly recognized in accordance with the provisions of regulation I/10 of the above Convention, as amended, and the lawful holder is authorized to perform the following functions at the levels specified, subject to any limitations indicated until .....or until the date of expiry of any extension of the validity of this endorsement as may be shown overleaf:

FUNCTION	LEVEL	LIMITATIONS APPLYING (IF ANY)

The lawful holder of this certificate may serve in the following capacity or capacities specified in the applicable safe manning requirements of the Administration:

CAPACITY	LIMITATIONS APPLYING (IF ANY)

Endorsement No. ..... issued on .....

(Official Seal)

.....
Signature of duly authorized official

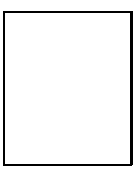
.....
Name of duly authorized official

The original of this certificate must be kept available in accordance with regulation I/2 paragraph 9 of the Convention while serving on a ship.

Date of birth of the holder of the certificate .....

Signature of the holder of the certificate .....

Photograph of the holder of the certificate



The validity of this certificate is hereby extended until	
(Official seal)	..... *Signature of duly authorized official*
Date of revalidation	..... *Name of duly authorized official*
The validity of this certificate is hereby extended until	
(Official seal)	..... *Signature of duly authorized official*
Date of revalidation	..... *Name of duly authorized official*

4 In using formats which may be different from those set forth in this section, pursuant to regulation I/2, paragraph 8, Parties shall ensure that in all cases:

1. all information relating to the identity and personal description of the holder, including name, date of birth, photograph and signature, along with the date on which the document was issued, shall be displayed on the same side of the documents; and

.2 all information relating to the capacity or capacities in which the holder is entitled to serve, in accordance with the applicable safe manning requirements of the Administration, as well as any limitations, shall be prominently displayed and easily identified.

Section A-I/3
Principles governing near-coastal voyages

(No provisions)

Section A-I/4
Control procedures

1 The assessment procedure provided for in regulation I/4, paragraph 1.3, resulting from any of the occurrences mentioned therein shall take the form of a verification that members of the crew who are required to be competent do in fact possess the necessary skills related to the occurrence.

2 It shall be borne in mind when making this assessment that on-board procedures are relevant to the International Safety Management (ISM) Code and that the provisions of this Convention are confined to the competence to safely execute those procedures.

3 Control procedures under this Convention shall be confined to the standards of competence of the individual seafarers on board and their skills related to watchkeeping as defined in part A of this Code. On-board assessment of competency shall commence with verification of the certificates of the seafarers.

4 Notwithstanding verification of the certificate, the assessment under regulation I/4, paragraph 1.3 can require the seafarer to demonstrate the related competency at the place of duty. Such demonstration may include verification that operational requirements in respect of watchkeeping standards have been met and that there is a proper response to emergency situations within the seafarer's level of competence.

5 In the assessment, only the methods for demonstrating competence together with the criteria for its evaluation and the scope of the standards given in part A of this Code shall be used.

Section A-I/5
National provisions

The provisions of regulation I/5 shall not be interpreted as preventing the allocation of tasks for training under supervision or in cases of *force majeure*.

Section A-I/6
Training and assessment

1. Each Party shall ensure that all training and assessment of seafarers for certification under the Convention is:

.1 structured in accordance with written programmes, including such methods and media of delivery, procedures, and course material as are necessary to achieve the prescribed standard of competence; and
.2 conducted, monitored, evaluated and supported by persons qualified in accordance with paragraphs 4, 5 and 6.

2 Persons conducting in-service training or assessment on board ship shall only do so when such training or assessment will not adversely affect the normal operation of the ship and they can dedicate their time and attention to training or assessment.

Qualifications of instructors, supervisors and assessors*

3 Each Party shall ensure that instructors, supervisors and assessors are appropriately qualified for the particular types and levels of training or assessment of competence of seafarers either on board or ashore, as required under the Convention, in accordance with the provisions of this section.

In-service training

4 Any person conducting in-service training of a seafarer, either on board or ashore, which is intended to be used in qualifying for certification under the Convention, shall:
.1 have an appreciation of the training programme and an understanding of the specific training objectives for the particular type of training being conducted;
.2 be qualified in the task for which training is being conducted; and
.3 if conducting training using a simulator:
.3.1 have received appropriate guidance in instructional techniques involving the use of simulators, and
.3.2 have gained practical operational experience on the particular type of simulator being used.

5 Any person responsible for the supervision of in-service training of a seafarer intended to be used in qualifying for certification under the Convention shall have a full understanding of the training programme and the specific objectives for each type of training being conducted.

* The following IMO Model Courses may be of assistance in the preparation of courses:

.1 IMO Model Course 6.09 – *Training Course for Instructors*
.2 IMO Model Course 3.12 – *Examination and Certification of Seafarers*

Assessment of competence

6 Any person conducting in-service assessment of competence of a seafarer, either on board or ashore, which is intended to be used in qualifying for certification under the Convention, shall:

.1 have an appropriate level of knowledge and understanding of the competence to be assessed;
.2 be qualified in the task for which the assessment is being made;
.3 have received appropriate guidance in assessment methods and practice;
.4 have gained practical assessment experience; and
.5 if conducting assessment involving the use of simulators, have gained practical assessment experience on the particular type of simulator under the supervision and to the satisfaction of an experienced assessor.

Training and assessment within an institution

7 Each Party which recognizes a course of training, a training institution, or a qualification granted by a training institution, as part of its requirements for the issue of a certificate required under the Convention, shall ensure that the qualifications and experience of instructors and assessors are covered in the application of the quality standard provisions of section A-I/8. Such qualification, experience and application of quality standards shall incorporate appropriate training in instructional techniques, and training and assessment methods and practice, and comply with all applicable requirements of paragraphs 4 to 6.

Section A-I/7
Communication of information

1 The information required by regulation I/7, paragraph 1 shall be communicated to the Secretary-General in the formats prescribed in paragraph 2 hereunder.

2 By 1 August 1998, or within one calendar year of entry into force of regulation I/7, whichever is later for the Party concerned, each Party shall report on the steps it has taken to give the Convention full and complete effect, which report shall include the following:

.1 the name, postal address and telephone and facsimile numbers and organization chart of the ministry, department or governmental agency responsible for administering the Convention;
.2 a concise explanation of the legal and administrative measures provided and taken to ensure compliance, particularly with regulations I/6 and I/9;
.3 a clear statement of the education, training, examination, competency assessment and certification policies adopted;

.4 a concise summary of the courses, training programmes, examinations and assessments provided for each certificate issued pursuant to the Convention;
.5 a concise outline of the procedures followed to authorize, accredit or approve training and examinations, medical fitness and competency assessments required by the Convention, the conditions attaching thereto, and a list of the authorizations, accreditations and approvals granted;
.6 a concise summary of the procedures followed in granting any dispensation under article VIII of the Convention; and
.7 the results of the comparison carried out pursuant to regulation I/11 and a concise outline of the refresher and upgrading training mandated.

3 Each Party shall, within six months of
.1 retaining or adopting any equivalent education or training arrangements pursuant to article IX, provide a full description of such arrangements;
.2 recognizing certificates issued by another Party, provide a report summarizing the measures taken to ensure compliance with regulation I/10; and
.3 authorizing the employment of seafarers holding alternative certificates issued under regulation VII/1 on ships entitled to fly its flag, provide the Secretary-General with a specimen copy of the type of safe manning documents issued to such ships.

4 Each Party shall report the results of each evaluation carried out pursuant to regulation I/8, paragraph 2 within six months of its completion, which report shall describe the terms of reference of the evaluators, their qualifications and experience, the date and scope of the evaluation, the deficiencies found and the corrective recommended and carried out.

5 The Secretary-General shall maintain a list of competent persons approved by the Maritime Safety Committee, including competent persons made available or recommended by the Parties, who may be called upon to assist in the preparation of the report required by regulation I/7, paragraph 2. These persons shall ordinarily be available during relevant sessions of the Maritime Safety Committee or its subsidiary bodies, but need not conduct their work solely during such sessions.

6 In relation to regulation I/7, paragraph 2, the competent persons shall be knowledgeable of the requirements of the Convention and at least one of them shall have knowledge of the system of training and certification of the Party concerned.

7 Any meeting of the competent persons shall:
.1 be held at the discretion of the Secretary-General;
.2 be comprised of an odd number of members, ordinarily not to exceed 5 persons;
.3 appoint its own chairman; and

.4 provide the Secretary-General with the agreed opinion of its members, or if no agreement is reached, with both the majority and minority views.

8 The competent persons shall, on a confidential basis, express their views in writing on:

.1 a comparison of the facts reported in the information communicated to the Secretary-General by the Party with all relevant requirements of the Convention;

.2 the report of any relevant evaluation submitted under regulation I/8, paragraph 3; and

.3 any additional information provided by the Party.

9 In preparing the report to the Maritime Safety Committee required by regulation I/7, paragraph 2, the Secretary-General shall:

.1 solicit and take into account the views expressed by competent persons selected from the list established pursuant to paragraph 5;

.2 seek clarification when necessary from the Party of any matter related to the information provided under regulation I/7, paragraph 1; and

.3 identify any area in which the Party may have requested assistance to implement the Convention.

10 The Party concerned shall be informed of the arrangements for the meetings of competent persons, and its representatives shall be entitled to be present to clarify any matter related to the information provided pursuant to regulation I/7, paragraph 1.

11 If the Secretary-General is not in a position to submit the report called for by paragraph 2 of regulation I/7, the Party concerned may request the Maritime Safety Committee to take the action contemplated by paragraph 3 of regulation I/7, taking into account the information submitted pursuant to this section and the views expressed in accordance with paragraphs 7 and 8.

Section A-I/8
Quality standards

National objectives and quality standards

1 Each Party shall ensure that the education and training objectives and related standards of competence to be achieved are clearly defined and identify the levels of knowledge, understanding and skills appropriate to the examinations and assessments required under the Convention. The objectives and related quality standards may be specified separately for different courses and training programmes and shall cover the administration of the certification system.

2 The field of application of the quality standards shall cover the administration of the certification system, all training courses and programmes, examinations and assessments carried out by or under the authority of a Party and the qualifications and experience required of instructors and assessors, having regard to the policies, systems, controls and internal quality assurance reviews established to ensure achievement of the defined objectives.

3 Each Party shall ensure that an independent evaluation of the knowledge, understanding, skills and competence acquisition and assessment activities, and of the administration of the certification system, is conducted at intervals of not more than five years in order to verify that:

.1 all internal management control and monitoring measures and follow-up actions comply with planned arrangements and documented procedures and are effective in ensuring achievement of the defined objectives;

.2 the results of each independent evaluation are documented and brought to the attention of those responsible for the area evaluated; and

.3 timely action is taken to correct deficiencies.

4 The report of the independent evaluation required by paragraph 3 of regulation I/8 shall include the terms of reference for the evaluation and the qualifications and experience of the evaluators.

Section A-I/9
Medical standards – Issue and registration of certificates

(No provisions)

Section A-I/10
Recognition of certificates

1 The provisions of regulation I/10, paragraph 4 regarding the non-recognition of certificates issued by a non-Party shall not be construed as preventing a Party, when issuing its own certificate, from accepting seagoing service, education and training acquired under the authority of a non-Party, provided the Parry complies with regulation I/9 in issuing each such certificate and ensures that the requirements of the Convention relating to seagoing service, education, training and competence are complied with.

2 Where an Administration which has recognized a certificate withdraws its endorsement of recognition for disciplinary reasons, the Administration shall inform the Party that issued the certificate of the circumstances

Section A-I/11
Revalidation of certificates

Professional competence

1 Continued professional competence as required under regulation I/11 shall be established by:

.1 approved seagoing service, performing functions appropriate to the certificate held, for a period of at least one year in total during the preceding five years; or

.2 having performed functions considered to be equivalent to the seagoing service required in paragraph 1.1; or

.3 one of the following:

.3.1 passing an approved test, or

.3.2 successfully completing an approved course or courses, or

.3.3 having completed approved seagoing service, performing functions appropriate to the certificate held, for a period of not less than three months in a supernumerary capacity, or in a lower officer rank than that for which the certificate held is valid immediately prior to taking up the rank for which it is valid.

2 The refresher and updating courses required by regulation I/11 shall be approved and include changes in relevant national and international regulations concerning the safety of life at sea and the protection of the marine environment and take account of any updating of the standard of competence concerned.

Section A-I/12
Standards governing the use of simulators

PART I – PERFORMANCE STANDARDS

General performance standards for simulators used in training

1 Each Party shall ensure that any simulator used for mandatory simulator-based training shall:

.1 be suitable for the selected objectives and training tasks;

.2 be capable of simulating the operating capabilities of shipboard equipment concerned, to a level of physical realism appropriate to training objectives, and include the capabilities, limitations and possible errors of such equipment;

.3 have sufficient behavioural realism to allow a trainee to acquire the skills appropriate to the training objectives;

.4 provide a controlled operating environment, capable of producing a variety of conditions, which may include emergency, hazardous or unusual situations relevant to the training objectives;

.5 provide an interface through which a trainee can interact with the equipment, the simulated environment and, as appropriate, the instructor; and
.6 permit an instructor to control, monitor and record exercises for the effective debriefing of trainees.

General performance standards for simulators used in assessment of competence

2 Each Party shall ensure that any simulator used for the assessment of competence required under the Convention or for any demonstration of continued proficiency so required shall:
.1 be capable of satisfying the specified assessment objectives;
.2 be capable of simulating the operational capabilities of the shipboard equipment concerned to a level of physical realism appropriate to the assessment objectives, and include the capabilities, limitations and possible errors of such equipment;
.3 have sufficient behavioural realism to allow a candidate to exhibit the skills appropriate to the assessment objectives;
.4 provide an interface through which a candidate can interact with the equipment and simulated environment;
.5 provide a controlled operating environment, capable of producing a Variety of conditions, which may include emergency, hazardous or unusual situations relevant to assessment objectives; and
.6 permit an assessor to control, monitor and record exercises for the effective assessment of the performance of candidates.

Additional performance standards

3 In addition to meeting the basic requirements set out in paragraphs 1 and 2, simulation equipment to which this section applies shall meet the performance standards given hereunder in accordance with their specific type.

Radar simulation

4 Radar simulation equipment shall be capable of simulating the operational capabilities of navigational radar equipment which meets all applicable performance standards adopted by the Organization* and incorporate facilities to:
.1 operate in the stabilized relative motion mode and sea and ground stabilized true motion modes

* See resolutions A.222(VII) – Performance Standards for Navigational Radar Equipment, A.278(VIII) – Supplement to the Recommendation on Performance Standards for Navigational Radar Equipment, and resolution A.477(XII) – Performance Standards for Radar Equipment.

.2 model weather, tidal streams, current, shadow sectors, spurious echoes and other propagation effects, and generate coastlines, navigational buoys and search and rescue transponders; and

.3 create a real-time operating environment incorporating at least two own-ship stations with ability to change own ship's course and speed, and include parameters for at least 20 target ships and appropriate communication facilities.

Automatic Radar Plotting Aid (ARPA) simulation

5 ARPA simulation equipment shall be capable of simulating the operational capabilities of ARPAs which meet all applicable performance standards adopted by the Organization,* and shall incorporate the facilities for:

.1 manual and automatic target acquisition;

.2 past track information;

.3 use of exclusion areas;

.4 vector/graphic time-scale and data display; and

.5 trial manoeuvres.

PART 2 – OTHER PROVISIONS

Simulator training objectives

6 Each Party shall ensure that the aims and objectives of simulator-based training are defined within an overall training programme and that specific training objectives and tasks are selected so as to relate as closely as possible to shipboard tasks and practices.

Training procedures

7 In conducting mandatory simulator-based training, instructors shall ensure that:

.1 trainees are adequately briefed beforehand on the exercise objectives and tasks and are given sufficient planning time before the exercise starts;

.2 trainees have adequate familiarization time on the simulator and with its equipment before any training or assessment exercise commences;

.3 guidance given and exercise stimuli are appropriate to the selected exercise objectives and tasks and to the level of trainee experience;

* See resolution A.422(XI) – Performance Standards for Automatic Radar Plotting Aids and resolution A.823(19) – Performance Standards for Automatic Radar Plotting Aids (ARPAs).

.4 exercises are effectively monitored, supported as appropriate by audio and visual observation of trainee activity and pre and post-exercise evaluation reports;
.5 trainees are effectively debriefed to ensure that training objectives have been met and that operational skills demonstrated are of an acceptable standard;
.6 the use of peer assessment during debriefing is encouraged; and
.7 simulator exercises are designed and tested so as to ensure their suitability for the specified training objectives.

Assessment procedures

8 Where simulators are used to assess the ability of candidates to demonstrate levels of competency, assessors shall ensure that:

.1 performance criteria are identified clearly and explicitly and are valid and available to the candidates;
.2 assessment criteria are established clearly and are explicit to ensure reliability and uniformity of assessment and to optimise objective measurement and evaluation, so that subjective judgements are kept to the minimum;
.3 candidates are briefed clearly on the tasks and/or skills to be assessed and on the tasks and performance criteria by which their competency will be determined;
.4 assessment of performance takes into account normal operating procedures and any behavioural interaction with other candidates on the simulator or simulator staff;
.5 scoring or grading methods to assess performance are used with caution until they have been validated; and
.6 the prime criterion is that a candidate demonstrates the ability to carry out a task safely and effectively to the satisfaction of the assessor.

Qualifications of instructors and assessors*

9 Each Party shall ensure that instructors and assessors are appropriately qualified and experienced for the particular types and levels of training and corresponding assessment of competence as specified in regulation I/6 and section A-I/6.

Section A-I/13
Conduct of trials

(No provisions)

* IMO Model Course 6.09 – *Training Course for Instructors*, and IMO Model Course 3.12 – *Examination and Certification of Seafarers* may be of assistance in the preparation of courses.

Section A-I/14
Responsibilities of companies

1 Companies,* masters and crew members each have responsibility for ensuring that the obligations set out in this section are given full and complete effect and that such other measures as may be necessary are taken to ensure that each crew member can make a knowledgeable and informed contribution to the safe operation of the ship.
2 The company shall provide written instructions to the master of each ship to which the Convention applies, setting forth the policies and the procedures to be followed to ensure that all seafarers who are newly employed on board the ship are given a reasonable opportunity to become familiar with the shipboard equipment, operating procedures and other arrangements needed for the proper performance of their duties, before being assigned to those duties. Such policies and procedures shall include:

.1 allocation of a reasonable period of time during which each newly employed seafarer will have an opportunity to become acquainted with:
  .1.1 the specific equipment the seafarer will be using or operating, and
  .1.2 ship-specific watchkeeping, safety, environmental protection and emergency procedures and arrangements the seafarer needs to know to perform the assigned duties properly; and
.2 designation of a knowledgeable crew member who will be responsible for ensuring that an opportunity is provided to each newly employed seafarer to receive essential information in a language the seafarer understands.

Section A-I/15
Transitional provisions

(No provisions)

* IMO Model Course 5.04 – *Human Resources Management* and IMO Model Course 6.03 – *Aspects of Ship Administration for Company Office Staff* may be of assistance in the preparation of courses.

Chapter II
Standards regarding the master and deck department

Section A-II/1
Mandatory minimum requirements for certification of officers in charge of a navigational watch on ships of 500 gross tonnage or more

Standard of competence

1 Every candidate for certification shall:

.1 be required to demonstrate the competence to undertake, at operational level, the tasks, duties and responsibilities listed in column 1 of table A-II/1;

.2 at least hold an appropriate certificate for performing VHF radiocommunications in accordance with the requirements of the Radio Regulations; and

.3 if designated to have primary responsibility for radiocommunications during distress incidents, hold an appropriate certificate issued or recognized under the provisions of the Radio Regulations.

2 The minimum knowledge, understanding and proficiency required for certification is listed in column 2 of table A-II/1.

3 The level of knowledge of the subjects listed in column 2 of table A-II/1 shall be sufficient for officers of the watch to carry out their watchkeeping duties.*

4 Training and experience to achieve the necessary level of theoretical knowledge, understanding and proficiency shall be based on section A-VIII/2, part 3-1 – Principles to be observed in keeping a navigational watch – and shall also take into account the relevant requirements of this part and the guidance given in part B of this Code.

5 Every candidate for certification shall be required to provide evidence of having achieved the required standard of competence in accordance with the methods for demonstrating competence and the criteria for evaluating competence tabulated in columns 3 and 4 of table A-II/1.

* IMO Model Course 7.03 – *Officer in Charge of a Navigational Watch* may be of assistance in the preparation of courses.

On-board training

6 Every candidate for certification as officer in charge of a navigational watch of ships of 500 gross tonnage or more whose seagoing service, in accordance with paragraph 2.2 of regulation II/1, forms part of a training programme approved as meeting the requirements of this section shall follow an approved programme of on-board training which:

.1 ensures that during the required period of seagoing service the candidate receives systematic practical training and experience in the tasks, duties and responsibilities of an officer in charge of a navigational watch, taking into account the guidance given in section B-II/1 of this Code;

.2 is closely supervised and monitored by qualified officers aboard the ships in which the approved seagoing service is performed; and

.3 is adequately documented in a training record book or similar document.*

Near-coastal voyages

7 The following subjects may be omitted from those listed in column 2 of table A-II/1 for issue of restricted certificates for service on near-coastal voyages, bearing in mind the safety of all ships which may be operating in the same waters:

.1 celestial navigation; and

.2 those electronic systems of position fixing and navigation that do not cover the waters for which the certificate is to be valid.

Section A-VI/3
Mandatory minimum training in advanced fire fighting

Standard of competence

1 Seafarers designated to control fire-fighting operations shall have successfully completed advanced training in techniques for fighting fire, with particular emphasis on organization, tactics and command, and shall be required to demonstrate competence to undertake the tasks, duties and responsibilities listed in column 1 of table A-VI/3.

2 The level of knowledge and understanding of the subjects listed in column 2 of table A-VI/3 shall be sufficient for the effective control of fire-fighting operations on board ship.**

* IMO Model Course 7.03 – *Officer in Charge of a Navigational Watch* and a similar document produced by the International Shipping Federation may be of assistance in the preparation of training record books.

** IMO Model Course 2.03 – *Advanced Training in Fire Fighting* may be of assistance in the preparation of courses.

3 Training and experience to achieve the necessary level of theoretical knowledge, understanding and proficiency shall take account of the guidance given in part B of this Code.

4 Every candidate for certification shall be required to provide evidence of having achieved the required standard of competence within the previous five years, in accordance with the methods for demonstrating competence and the criteria for evaluating competence tabulated in columns 3 and 4 of table A-VI/3.

Section A-VI/4
Mandatory minimum requirements related to medical first aid and medical care

Standard of competence for seafarers designated to provide medical first aid on board ship

1 Every seafarer who is designated to provide medical first aid on board ship shall be required to demonstrate the competence to undertake the tasks, duties and responsibilities listed in column 1 of table A-VI/4-1.

2 The level of knowledge of the subjects listed in column 2 of table A-VI/4-1 shall be sufficient to enable the designated seafarer to take immediate effective action in the case of accidents or illness likely to occur on board ship.*

3 Every candidate for certification under the provisions of regulation VI/4, paragraph 1 shall be required to provide evidence that the required standard of competence has been achieved in accordance with the methods for demonstrating competence and the criteria for evaluating competence tabulated in columns 3 and 4 of table A-VI/4-1.

Standard of competence for seafarers designated to take charge of medical care on board ship

4 Every seafarer who is designated to take charge of medical care on board ship shall be required to demonstrate the competence to undertake the tasks, duties and responsibilities listed in column 1 of table A-VI/4-2.

5 The level of knowledge of the subjects listed in column 2 of table A-VI/4-2 shall be sufficient to enable the designated seafarer to take immediate effective action in the case of accidents or illness likely to occur on board ship.**

6 Every candidate for certification under the provisions of regulation VI/4, paragraph 2 shall be required to provide evidence that the required standard of competence

* IMO Model Course 1.14 – *Medical Emergency – First Aid* may be of assistance in the preparation of courses.

** IMO Model Course 1.15 – *Medical Care* may be of assistance in the preparation of courses.

has been achieved in accordance with the methods for demonstrating competence and the criteria for evaluating competence tabulated in columns 3 and 4 of table A-VI/4-2.

Chapter VII
Standards regarding alternative certification

Section A-VII/1
Issue of alternative certificates

1 Every candidate for certification at the operational level under the provisions of chapter VII of the annex to the Convention shall be required to complete relevant education and training and meet the standard of competence for all the functions prescribed in either table A-II/1 or table A-III/1. Functions specified in tables A-II/1 or A-III/1 respectively may be added provided the candidate completes, as appropriate, additional relevant education and training and meets the standards of competence prescribed in those tables for the functions concerned.

2 Every candidate for certification at the management level as the person having command of a ship of 500 gross tonnage or more, or the person upon whom the command of a ship will fall in the event of the incapacity of the person in command, shall be required, in addition to compliance with the standard of competence specified in table A-II/1, to complete relevant education and training and meet the standards of competence for all of the functions prescribed in table A-II/2. Functions specified in the tables of chapter III of this part may be added provided the candidate completes, as appropriate, additional relevant education and training and meets the standards of competence prescribed in those tables for the functions concerned.

3 Every candidate for certification at the management level as the person responsible for the mechanical propulsion of a ship powered by main propulsion machinery of 750 kW or more, or the person upon whom such responsibility will fall in the event of the incapacity of the person responsible for the mechanical propulsion of the ship, shall be required, in addition to compliance with the standard of competence specified in table A-III/1, to complete relevant education and training and meet the standards of competence for all of the functions prescribed in table A-III/2, as appropriate. Functions specified in the tables of chapter II of this part may be added provided the candidate completes, as appropriate, additional relevant education and training and meets the standards of competence prescribed in those tables for the functions concerned.

4 Every candidate for certification at the support level in navigation or marine engineering shall comply with the standard of competence prescribed in table A-II/4 or A-III/4 of this part, as appropriate.

Section A-VII/2
Certification of seafarers

1 In accordance with the requirements of regulation VII/1, paragraph 1.3, every candidate for certification under the provisions of chapter VII at operational level in functions specified in tables A-II/1 or A-III/1 shall:

.1 have approved seagoing service of not less than one year, which service shall include a period of at least six months performing engine-room duties under the supervision of a qualified engineer officer and, where the function of navigation is required, a period of at least six months performing bridge watchkeeping duties under the supervision of a qualified bridge watchkeeping officer; and

.2 have completed, during this service, on-board training programmes approved as meeting the relevant requirements of sections A-II/1 and A-III/1 and documented in an approved training record book.

2 Every candidate for certification under the provisions of chapter VII at the management level in a combination of functions specified in tables A-II/2 and A-III/2 shall have approved seagoing service related to the functions to be shown in the endorsement to the certificate as follows:

.1 *for persons other than those having command or responsibility for the mechanical propulsion of a ship* – 12 months performing duties at the operational level related to regulation III/2 or III/3 as appropriate and, where the function of navigation at the management level is required, at least 12 months performing bridge watchkeeping duties at the operational level;

.2 *for those having command or the responsibility for the mechanical propulsion of a ship* – not less than 48 months, including the provisions in paragraph 2.1 of this section, performing, as a certificated officer, duties related to the functions to be shown in the endorsement to the certificate, of which 24 months shall be served performing functions set out in table A-II/1 and 24 months shall be served performing functions set out in tables A-III/1 and A-III/2.

Section A-VII/3
Principles governing the issue of alternative certificates

(No provisions)

Chapter VIII
Standards regarding watchkeeping

Section A-VIII/1
Fitness for duty

1 All persons who are assigned duty as officer in charge of a watch or as a rating forming part of a watch shall be provided a minimum of 10 hours of rest in any 24 hour period.

2 The hours of rest may be divided into no more than two periods, one of which shall be at least 6 hours in length.

3 The requirements for rest periods laid down in paragraphs 1 and 2 need not be maintained in the case of an emergency or drill or in other overriding operational conditions.

4 Notwithstanding the provisions of paragraphs 1 and 2, the minimum period of ten hours may be reduced to not less than 6 consecutive hours provided that any such reduction shall not extend beyond two days and not less than 70 hours of rest are provided each seven-day period.

5 Administrations shall require that watch schedules be posted where they are easily accessible.

Section A-VIII/2
Watchkeeping arrangements and principles to be observed

PART 1 – CERTIFICATION

1 The officer in charge of the navigational or deck watch shall be duly qualified in accordance with the provisions of chapter II, or chapter VII appropriate to the duties related to navigational or deck watchkeeping.

2 The officer in charge of the engineering watch shall be duly qualified in accordance with the provisions of chapter III, or chapter VII appropriate to the duties related to engineering watchkeeping.

PART 2 – VOYAGE PLANNING

General requirements

3 The intended voyage shall be planned in advance, taking into consideration all pertinent information, and any course laid down shall be checked before the voyage commences.

4 The chief engineer officer shall, in consultation with the master, determine in advance the needs of the intended voyage, taking into consideration the requirements for fuel, water, lubricants, chemicals, expendable and other spare parts, tools, supplies and any other requirements.

Planning prior to each voyage

5 Prior to each voyage the master of every ship shall ensure that the intended route from the port of departure to the first port of call is planned using adequate and appropriate charts and other nautical publications necessary for the intended voyage, containing accurate, complete and up-to-date information regarding those navigational limitations and hazards which are of a permanent or predictable nature and which are relevant to the safe navigation of the ship.

Verification and display of planned route

6 When the route planning is verified taking into consideration all pertinent information, the planned route shall be clearly displayed on appropriate charts and shall be continuously available to the officer in charge of the watch, who shall verify each course to be followed prior to using it during the voyage.

Deviation from planned route

7 If a decision is made, during a voyage, to change the next port of call of the planned route, or if it is necessary for the ship to deviate substantially from the planned route for other reasons, then an amended route shall be planned prior to deviating substantially from the route originally planned.

PART 3 – WATCHKEEPING AT SEA

Principles applying to watchkeeping generally

8 Parties shall direct the attention of companies, masters, chief engineer officers and watchkeeping personnel to the following principles, which shall be observed to ensure that safe watches are maintained at all times.

9 The master of every ship is bound to ensure that watchkeeping arrangements are adequate for maintaining a safe navigational watch. Under the master's general direction, the officers of the navigational watch are responsible for navigating the ship safely during their periods of duty, when they will be particularly concerned with avoiding collision and stranding.

10 The chief engineer officer of every ship is bound, in consultation with the master, to ensure that watchkeeping arrangements are adequate to maintain a safe engineering watch.

Protection of marine environment

11 The master, officers and ratings shall be aware of the serious effects of operational or accidental pollution of the marine environment and shall take all possible precautions to prevent such pollution, particularly within the framework of relevant international and port regulations.

Part 3-1 – Principles to be observed in keeping a navigational watch

12 The officer in charge of the navigational watch is the master's representative and is primarily responsible at all times for the safe navigation of the ship and for complying with the International Regulations for Preventing Collisions at Sea, 1972.

Look-out

13 A proper look-out shall be maintained at all times in compliance with rule 5 of the International Regulations for Preventing Collisions at Sea, 1972 and shall serve the purpose of:

.1 maintaining a continuous state of vigilance by sight and hearing as well as by all other available means, with regard to any significant change in the operating environment;

.2 fully appraising the situation and the risk of collision, stranding and other dangers to navigation; and

.3 detecting ships or aircraft in distress, shipwrecked persons, wrecks, debris and other hazards to safe navigation.

14 The look-out must be able to give full attention to the keeping of a proper look-out and no other duties shall be undertaken or assigned which could interfere with that task.

15 The duties of the look-out and helmsperson are separate and the helmsperson shall not be considered to be the look-out while steering, except in small ships where an unobstructed all-round view is provided at the steering position and there is no impairment of night vision or other impediment to the keeping of a proper look-out. The officer in charge of the navigational watch may be the sole look-out in daylight provided that on each such occasion:

.1 the situation has been carefully assessed and it has been established without doubt that it is safe to do so;

.2 full account has been taken of all relevant factors, including, but not limited to:

- state of weather,
- visibility,
- traffic density,
- proximity of dangers to navigation, and
- the attention necessary when navigating in or near traffic separation schemes; and

.3 assistance is immediately available to be summoned to the bridge when any change in the situation so requires.

16 In determining that the composition of the navigational watch is adequate to ensure that a proper look-out can continuously be maintained, the master shall take into account all relevant factors, including those described in this section of the Code, as well as the following factors:

.1 visibility, state of weather and sea;

.2 traffic density, and other activities occurring in the area in which the vessel is navigating;

.3 the attention necessary when navigating in or near traffic separation schemes or other routeing measures;

.4 the additional workload caused by the nature of the ship's functions, immediate operating requirements and anticipated manoeuvres;

.5 the fitness for duty of any crew members on call who are assigned as members of the watch;

.6 knowledge of and confidence in the professional competence of the ship's officers and crew;

.7 the experience of each officer of the navigational watch, and the familiarity of that officer with the ship's equipment, procedures, and manoeuvring capability;
.8 activities taking place on board the ship at any particular time, including radiocommunication activities, and the availability of assistance to be summoned immediately to the bridge when necessary;
.9 the operational status of bridge instrumentation and controls, including alarm systems;
.10 rudder and propeller control and ship manoeuvring characteristics;
.11 the size of the ship and the field of vision available from the conning position;
.12 the configuration of the bridge, to the extent such configuration might inhibit a member of the watch from detecting by sight or hearing any external development; and
.13 any other relevant standard, procedure or guidance relating to watchkeeping arrangements and fitness for duty which has been adopted by the Organization.

Watch arrangements

17 When deciding the composition of the watch on the bridge, which may include appropriately qualified ratings, the following factors, *inter alia*, shall be taken into account:

.1 at no time shall the bridge be left unattended;
.2 weather conditions, visibility and whether there is daylight or darkness;
.3 proximity of navigational hazards which may make it necessary for the officer in charge of the watch to carry out additional navigational duties;
.4 use and operational condition of navigational aids such as radar or electronic position-indicating devices and any other equipment affecting the safe navigation of the ship;
.5 whether the ship is fitted with automatic steering;
.6 whether there are radio duties to be performed;
.7 unmanned machinery space (UMS) controls, alarms and indicators provided on the bridge, procedures for their use and limitations; and
.8 any unusual demands on the navigational watch that may arise as a result of special operational circumstances.

Taking over the watch

18 The officer in charge of the navigational watch shall not hand over the watch to the relieving officer if there is reason to believe that the latter is not capable of

carrying out the watchkeeping duties effectively, in which case the master shall be notified.

19 The relieving officer shall ensure that the members of the relieving watch are fully capable of performing their duties, particularly as regards their adjustment to night vision. Relieving officers shall not take over the watch until their vision is fully adjusted to the light conditions.

20 Prior to taking over the watch, relieving officers shall satisfy themselves as to the ship's estimated or true position and confirm its intended track, course and speed, and UMS controls as appropriate and shall note any dangers to navigation expected to be encountered during their watch.

21 Relieving officers shall personally satisfy themselves regarding the:
- .1 standing orders and other special instructions of the master relating to navigation of the ship;
- .2 position, course, speed and draught of the ship;
- .3 prevailing and predicted tides, currents, weather, visibility and the effect of these factors upon course and speed;
- .4 procedures for the use of main engines to manoeuvre when the main engines are on bridge control; and
- .5 navigational situation, including but not limited to:
  - .5.1 the operational condition of all navigational and safety equipment being used or likely to be used during the watch,
  - .5.2 the errors of gyro- and magnetic compasses,
  - .5.3 the presence and movement of ships in sight or known to be in the vicinity,
  - .5.4 the conditions and hazards likely to be encountered during the watch, and
  - .5.5 the possible effects of heel, trim, water density and squat on underkeel clearance.

22 If at any time the officer in charge of the navigational watch is to be relieved when a manoeuvre or other action to avoid any hazard is taking place, the relief of that officer shall be deferred until such action has been completed.

Performing the navigational watch

23 The officer in charge of the navigational watch shall:
- .1 keep the watch on the bridge;
- .2 in no circumstances leave the bridge until properly relieved;
- .3 continue to be responsible for the safe navigation of the ship, despite the presence of the master on the bridge, until informed specifically that the master has assumed that responsibility and this is mutually understood; and

.4 notify the master when in any doubt as to what action to take in the interest of safety.

24 During the watch the course steered, position and speed shall be checked at sufficiently frequent intervals, using any available navigational aids necessary, to ensure that the ship follows the planned course.

25 The officer in charge of the navigational watch shall have full knowledge of the location and operation of all safety and navigational equipment on board the ship and shall be aware and take account of the operating limitations of such equipment.

26 The officer in charge of the navigational watch shall not be assigned or undertake any duties which would interfere with the safe navigation of the ship.

27 Officers of the navigational watch shall make the most effective use of all navigational equipment at their disposal.

28 When using radar, the officer in charge of the navigational watch shall bear in mind the necessity to comply at all times with the provisions on the use of radar contained in the International Regulations for Preventing Collisions at Sea, in force.

29 In cases of need, the officer in charge of the navigational watch shall not hesitate to use the helm, engines and sound signalling apparatus. However, timely notice of intended variations of engine speed shall be given where possible or effective use made of UMS engine controls provided on the bridge in accordance with the applicable procedures.

30 Officers of the navigational watch shall know the handling characteristics of their ship, including its stopping distances, and should appreciate that other ships may have different handling characteristics.

31 A proper record shall be kept during the watch of the movements and activities relating to the navigation of the ship.

32 It is of special importance that at all times the officer in charge of the navigational watch ensures that a proper look-out is maintained. In a ship with a separate chartroom the officer in charge of the navigational watch may visit the chartroom, when essential, for a short period for the necessary performance of navigational duties, but shall first ensure that it is safe to do so and that proper lookout is maintained.

33 Operational tests of shipboard navigational equipment shall be carried out at sea as frequently as practicable and as circumstances permit, in particular before hazardous conditions affecting navigation are expected. Whenever appropriate, these tests shall be recorded. Such tests shall also be carried out prior to port arrival and departure.

34 The officer in charge of the navigational watch shall make regular checks to ensure that:

.1 the person steering the ship or the automatic pilot is steering the correct course;

.2 the standard compass error is determined at least once a watch and, when possible, after any major alteration of course; the standard and gyrocompasses are frequently compared and repeaters are synchronized with their master compass;

.3 the automatic pilot is tested manually at least once a watch;

.4 the navigation and signal lights and other navigational equipment are functioning properly;

.5 the radio equipment is functioning properly in accordance with paragraph 86 of this section; and

.6 the UMS controls, alarms and indicators are functioning properly.

35 The officer in charge of the navigational watch shall bear in mind the necessity to comply at all times with the requirements in force of the International Convention for the Safety of Life at Sea (SOLAS), 1974.* The officer of the navigational watch shall take into account:

.1 the need to station a person to steer the ship and to put the steering into manual control in good time to allow any potentially hazardous situation to be dealt with in a safe manner; and

.2 that with a ship under automatic steering it is highly dangerous to allow a situation to develop to the point where the officer in charge of the navigational watch is without assistance and has to break the continuity of the look-out in order to take emergency action.

36 Officers of the navigational watch shall be thoroughly familiar with the use of all electronic navigational aids carried, including their capabilities and limitations, and shall use each of these aids when appropriate and shall bear in mind that the echosounder is a valuable navigational aid.

37 The officer in charge of the navigational watch shall use the radar whenever restricted visibility is encountered or expected. and at all times in congested waters, having due regard to its limitations.

38 The officer in charge of the navigational watch shall ensure that range scales employed are changed at sufficiently frequent intervals so that echoes are detected as early as possible. It shall be borne in mind that small or poor echoes may escape detection.

* See regulations V/19, V/19-1 and V/19-2.

39 Whenever radar is in use, the officer in charge of the navigational watch shall select an appropriate range scale and observe the display carefully, and shall ensure that plotting or systematic analysis is commenced in ample time.

40 The officer in charge of the navigational watch shall notify the master immediately:

.1 if restricted visibility is encountered or expected;
.2 if the traffic conditions or the movements of other ships are causing concern;
.3 if difficulty is experienced in maintaining course;
.4 on failure to sight land, a navigation mark or to obtain soundings by the expected time;
.5 if, unexpectedly, land or a navigation mark is sighted or a change in soundings occurs;
.6 on breakdown of the engines, propulsion machinery remote control, steering gear or any essential navigational equipment, alarm or indicator;
.7 if the radio equipment malfunctions;
.8 in heavy weather, if in any doubt about the possibility of weather damage;
.9 if the ship meets any hazard to navigation, such as ice or a derelict; and
.10 in any other emergency or if in any doubt.

41 Despite the requirement to notify the master immediately in the foregoing circumstances, the officer in charge of the navigational watch shall in addition not hesitate to take immediate action for the safety of the ship, where circumstances so require.

42 The officer in charge of the navigational watch shall give watchkeeping personnel all appropriate instructions and information which will ensure the keeping of a safe watch, including a proper look-out.

Watchkeeping under different conditions and in different areas
Clear weather

43 The officer in charge of the navigational watch shall take frequent and accurate compass bearings of approaching ships as a means of early detection of risk of collision and bear in mind that such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large ship or a tow or when approaching a ship at close range. The officer in charge of the navigational watch shall also take early and positive action in compliance with the applicable International Regulations for Preventing Collisions at Sea, 1972 and subsequently check that such action is having the desired effect.

44 In clear weather, whenever possible, the officer in charge of the navigational watch shall carry out radar practice.

Restricted visibility

45 When restricted visibility is encountered or expected, the first responsibility of the officer in charge of the navigational watch is to comply with the relevant rules of the International Regulations for Preventing Collisions at Sea, 1972 with particular regard to the sounding of fog signals, proceeding at a safe speed and having the engines ready for immediate manoeuvre. In addition, the officer in charge of the navigational watch shall:

.1 inform the master;
.2 post a proper look-out;
.3 exhibit navigation lights; and
.4 operate and use the radar.

In hours of darkness

46 The master and the officer in charge of the navigational watch, when arranging look-out duty, shall have due regard to the bridge equipment and navigational aids available for use, their limitations; procedures and safeguards implemented.

Coastal and congested waters

47 The largest scale chart on board, suitable for the area and corrected with the latest available information, shall be used. Fixes shall be taken at frequent intervals, and shall be carried out by more than one method whenever circumstances allow.

48 The officer in charge of the navigational watch shall positively identify all relevant navigation marks.

Navigation with pilot on board

49 Despite the duties and obligations of pilots, their presence on board does not relieve the master or officer in charge of the navigational watch from their duties and obligations for the safety of the ship. The master and the pilot shall exchange information regarding navigation procedures, local conditions and the ship's characteristics. The master and/or the officer in charge of the navigational watch shall co-operate closely with the pilot and maintain an accurate check on the ship's position and movement.

50 If in any doubt as to the pilot's actions or intentions, the officer in charge of the navigational watch shall seek clarification from the pilot and, if doubt still exists, shall notify the master immediately and take whatever action is necessary before the master arrives.

Ship at anchor

51 If the master considers it necessary, a continuous navigational watch shall be maintained at anchor. While at anchor, the officer in charge of the navigational watch shall:

.1 determine and plot the ship's position on the appropriate chart as soon as practicable;
.2 when circumstances permit, check at sufficiently frequent intervals whether the ship is remaining securely at anchor by taking bearings of fixed navigation marks or readily identifiable shore objects;
.3 ensure that proper look-out is maintained;
.4 ensure that inspection rounds of the ship are made periodically;
.5 observe meteorological and tidal conditions and the state of the sea;
.6 notify the master and undertake all necessary measures if the ship drags anchor;
.7 ensure that the state of readiness of the main engines and other machinery is in accordance with the master's instructions;
.8 if visibility deteriorates, notify the master;
.9 ensure that the ship exhibits the appropriate lights and shapes and that appropriate sound signals are made in accordance with all applicable regulations; and
.10 take measures to protect the environment from pollution by the ship and comply with applicable pollution regulations.

Part 3-2 – Principles to be observed in keeping an engineering watch

52 The term *engineering watch* as used in parts 3-2, 4-2 and 4-4 of this section means either a person or a group of personnel comprising the watch or a period of responsibility for an officer during which the physical presence in machinery spaces of that officer may or may not be required.

53 The *officer in charge of the engineering watch* is the chief engineer officer's representative and is primarily responsible, at all times, for the safe and efficient operation and upkeep of machinery affecting the safety of the ship and is responsible for the inspection, operation and testing, as required, of all machinery and equipment under the responsibility of the engineering watch.

Watch arrangements

54 The composition of the engineering watch shall, at all times, be adequate to ensure the safe operation of all machinery affecting the operation of the ship, in either

automated or manual mode, and be appropriate to the prevailing circumstances and conditions.

55 When deciding the composition of the engineering watch, which may include appropriately qualified ratings, the following criteria, *inter alia*, shall be taken into account:

.1 the type of ship and the type and condition of the machinery;
.2 the adequate supervision, at all times, of machinery affecting the safe operation of the ship;
.3 any special modes of operation dictated by conditions such as weather, ice, contaminated water, shallow water, emergency conditions, damage containment or pollution abatement;
.4 the qualifications and experience of the engineering watch;
.5 the safety of life, ship, cargo and port, and protection of the environment;
.6 the observance of international, national and local regulations; and
.7 maintaining the normal operations of the ship.

Taking over the watch

56 The officer in charge of the engineering watch shall not hand over the watch to the relieving officer if there is reason to believe that the latter is obviously not capable of carrying out the watchkeeping duties effectively, in which case the chief engineer officer shall be notified.

57 The relieving officer of the engineering watch shall ensure that the members of the relieving engineering watch are apparently fully capable of performing their duties effectively.

58 Prior to taking over the engineering watch, relieving officers shall satisfy themselves regarding at least the following:

.1 the standing orders and special instructions of the chief engineer officer relating to the operation of the ship's systems and machinery;
.2 the nature of all work being performed on machinery and systems, the personnel involved and potential hazards.
.3 the level and, where applicable, the condition of water or residues in bilges, ballast tanks, slop tanks, reserve tanks, fresh water tanks, sewage tanks and any special requirements for use or disposal of the contents thereof;
.4 the condition and level of fuel in the reserve tanks, settling tank, day tank and other fuel storage facilities;
.5 any special requirements relating to sanitary system disposals;
.6 condition and mode of operation of the various main and auxiliary systems, including the electrical power distribution system;

.7 where applicable, the condition of monitoring and control console equipment, and which equipment is being operated manually;
.8 where applicable, the condition and mode of operation of automatic boiler controls such as flame safeguard control systems, limit control systems, combustion control systems, fuel-supply control systems and other equipment related to the operation of steam boilers;
.9 any potentially adverse conditions resulting from bad weather, ice, or contaminated or shallow water;
.10 any special modes of operation dictated by equipment failure or adverse ship conditions;
.11 the reports of engine-room ratings relating to their assigned duties;
.12 the availability of fire-fighting appliances; and
.13 the state of completion of engine-room log.

Performing the engineering watch

59 The officer in charge of the engineering watch shall ensure that the established watchkeeping arrangements are maintained and that, under direction, engine-room ratings, if forming part of the engineering watch, assist in the safe and efficient operation of the propulsion machinery and auxiliary equipment.

60 The officer in charge of the engineering watch shall continue to be responsible for machinery-space operations, despite the presence of the chief engineer officer in the machinery spaces, until specifically informed that the chief engineer officer has assumed that responsibility and this is mutually understood.

61 All members of the engineering watch shall be familiar with their assigned watchkeeping duties. In addition, every member shall, with respect to the ship they are serving in, have knowledge of:

.1 the use of appropriate internal communication systems;
.2 the escape routes from machinery spaces;
.3 the engine-room alarm systems and be able to distinguish between the various alarms, with special reference to the fire-extinguishing media alarm; and
.4 the number, location and types of fire-fighting equipment and damage-control gear in the machinery spaces, together with their use and the various safety precautions to be observed.

62 Any machinery not functioning properly, expected to malfunction or requiring special service shall be noted along with any action already taken. Plans shall be made for any further action if required.

63 When the machinery spaces are in the manned condition, the officer in charge of the engineering watch shall at all times be readily capable of operating the propulsion equipment in response to needs for changes in direction or speed.

64 When the machinery spaces are in the periodic unmanned condition, the designated duty officer in charge of the engineering watch shall be immediately available and on call to attend the machinery spaces.

65 All bridge orders shall be promptly executed. Changes in direction or speed of the main propulsion units shall be recorded, except where an Administration has determined that the size or characteristics of a particular ship make such recording impracticable. The officer in charge of the engineering watch shall ensure that the main propulsion unit controls, when in the manual mode of operation, are continuously attended under stand-by or manoeuvring conditions.

66 Due attention shall be paid to the ongoing maintenance and support of all machinery, including mechanical, electrical, electronic, hydraulic and pneumatic systems, their control apparatus and associated safety equipment, all accommodation service systems equipment and the recording of stores and spare gear usage.

67 The chief engineer officer shall ensure that the officer in charge of the engineering watch is informed of all preventive maintenance, damage control, or repair operations to be performed during the engineering watch. The officer in charge of the engineering watch shall be responsible for the isolation, bypassing and adjustment of all machinery under the responsibility of the engineering watch that is to be worked on, and shall record all work carried out.

68 When the engine-room is put in a stand-by condition, the officer in charge of the engineering watch shall ensure that all machinery and equipment which may be used during manoeuvring is in a state of immediate readiness and that an adequate reserve of power is available for steering gear and other requirements.

69 Officers in charge of an engineering watch shall not be assigned or undertake any duties which would interfere with their supervisory duties in respect of the main propulsion system and ancillary equipment. They shall keep the main propulsion plant and auxiliary systems under constant supervision until properly relieved, and shall periodically inspect the machinery in their charge. They shall also ensure that adequate rounds of the machinery and steering-gear spaces are made for the purpose of observing and reporting equipment malfunctions or breakdowns, performing or directing routine adjustments, required upkeep and any other necessary tasks.

70 Officers in charge of an engineering watch shall direct any other member of the engineering watch to inform them of potentially hazardous conditions which may adversely affect the machinery or jeopardize the safety of life or of the ship.

71 The officer in charge of the engineering watch shall ensure that the machinery space watch is supervised, and shall arrange for substitute personnel in the event of the incapacity of any engineering watch personnel. The engineering watch shall not leave the machinery spaces unsupervised in a manner that would prevent the manual operation of the engine-room plant or throttles.

72 The officer in charge of the engineering watch shall take the action necessary to contain the effects of damage resulting from equipment breakdown, fire, flooding, rupture, collision, stranding, or other cause.

73 Before going off duty, the officer in charge of the engineering watch shall ensure that all events related to the main and auxiliary machinery which have occurred during the engineering watch are suitably recorded.

74 The officer in charge of the engineering watch shall co-operate with any engineer in charge of maintenance work during all preventive maintenance, damage control or repairs. This shall include but not necessarily be limited to:

.1 isolating and bypassing machinery to be worked on;
.2 adjusting the remaining plant to function adequately and safely during the maintenance period;
.3 recording, in the engine-room log or other suitable document, the equipment worked on and the personnel involved, and which safety steps have been taken and by whom, for the benefit of relieving officers and for record purposes; and
.4 testing and putting into service, when necessary, the repaired machinery or equipment.

75 The officer in charge of the engineering watch shall ensure that any engine-room ratings who perform maintenance duties are available to assist in the manual operation of machinery in the event of automatic equipment failure.

76 The officer in charge of the engineering watch shall bear in mind that changes in speed, resulting from machinery malfunction, or any loss of steering, may imperil the safety of the ship and life at sea. The bridge shall be immediately notified, in the event of fire, and of any impending action in machinery spaces that may cause reduction in the ship's speed, imminent steering failure, stoppage of the ship's propulsion system or any alteration in the generation of electric power or similar threat to safety. This notification, where possible, shall be accomplished before changes are made, in order to afford the bridge the maximum available time to take whatever action is possible to avoid a potential marine casualty.

77 The officer in charge of the engineering watch shall notify the chief engineer officer without delay:

.1 when engine damage or a malfunction occurs which may be such as to endanger the safe operation of the ship;

.2 when any malfunction occurs which, it is believed, may cause damage or breakdown of propulsion machinery, auxiliary machinery or monitoring and governing systems; and
.3 in any emergency or if in any doubt as to what decision or measures to take.

78 Despite the requirement to notify the chief engineer officer in the foregoing circumstances, the officer in charge of the engineering watch shall not hesitate to take immediate action for the safety of the ship, its machinery and crew where circumstances require.

79 The officer in charge of the engineering watch shall give the watchkeeping personnel all appropriate instructions and information which will ensure the keeping of a safe engineering watch. Routine machinery upkeep, performed as incidental tasks as a part of keeping a safe watch, shall be set up as an integral part of the watch routine. Detailed repair maintenance involving repairs to electrical, mechanical, hydraulic, pneumatic or applicable electronic equipment throughout the ship shall be performed with the cognizance of the officer in charge of the engineering watch and chief engineer officer. These repairs shall be recorded.

Engineering watchkeeping under different conditions and in different areas

Restricted visibility

80 The officer in charge of the engineering watch shall ensure that permanent air or steam pressure is available for sound signals and that at all times bridge orders relating to changes in speed or direction of operation are immediately implemented and, in addition, that auxiliary machinery used for manoeuvring is readily available.

Coastal and congested waters

81 The officer in charge of the engineering watch shall ensure that all machinery involved with the manoeuvring of the ship can immediately be placed in the manual mode of operation when notified that the ship is in congested waters. The officer in charge of the engineering watch shall also ensure that an adequate reserve of power is available for steering and other manoeuvring requirements. Emergency steering and other auxiliary equipment shall be ready for immediate operation.

Ship at anchor

82 At an unsheltered anchorage the chief engineer officer shall consult with the master whether or not to maintain the same engineering watch as when under way.

83 When a ship is at anchor in an open roadstead or any other virtually "at-sea" condition, the engineer officer in charge of the engineering watch shall ensure that:

.1 an efficient engineering watch is kept;
.2 periodic inspection is made of all operating and stand-by machinery;
.3 main and auxiliary machinery is maintained in a state of readiness in accordance with orders from the bridge;
.4 measures are taken to protect the environment from pollution by the ship, and that applicable pollution-prevention regulations are complied with; and
.5 all damage-control and fire-fighting systems are in readiness.

Part 3-3 – Principles to be observed in keeping a radio watch

General provisions

84 Administrations shall direct the attention of companies, masters and radio watchkeeping personnel to comply with the following provisions to ensure that an adequate safety radio watch is maintained while a ship is at sea. In complying with this Code, account shall be taken of the Radio Regulations.

Watch arrangements

85 In deciding the arrangements for the radio watch, the master of every seagoing ship shall:

.1 ensure that the radio watch is maintained in accordance with the relevant provisions of the Radio Regulations and the SOLAS Convention;
.2 ensure that the primary duties for radio watchkeeping are not adversely affected by attending to radio traffic not relevant to the safe movement of the ship and safety of navigation; and
.3 take into account the radio equipment fitted on board and its operational status.

Performing the radio watch

86 The radio operator performing radio watchkeeping duties shall:

.1 ensure that watch is maintained on the frequencies specified in the Radio Regulations and the SOLAS Convention; and
.2 while on duty, regularly check the operation of the radio equipment and its sources of energy and report to the master any observed failure of this equipment.

87 The requirements of the Radio Regulations and the SOLAS Convention on keeping a radiotelegraph or radio log, as appropriate, shall be complied with.

88 The maintenance of radio records, in compliance with the requirements of the Radio Regulations and the SOLAS Convention, is the responsibility of the radio operator designated as having primary responsibility for radiocommunications during distress incidents. The following shall be recorded, together with the times at which they occur:

.1 a summary of distress, urgency and safety radiocommunications;
.2 important incidents relating to the radio service;
.3 where appropriate, the position of the ship at least once per day; and
.4 a summary of the condition of the radio equipment, including its sources of energy.

89 The radio records shall be kept at the distress communications operating position, and shall be made available:

.1 for inspection by the master; and
.2 for inspection by any authorized official of the Administration and by any duly authorized officer exercising control under article X of the Convention.

PART 4 – WATCHKEEPING IN PORT

Principles applying to all watchkeeping

General

90 On any ship safely moored or safely at anchor under normal circumstances in port, the master shall arrange for an appropriate and effective watch to be maintained for the purpose of safety. Special requirements may be necessary for special types of ships' propulsion systems or ancillary equipment and for ships carrying hazardous, dangerous, toxic or highly flammable materials or other special types of cargo.

Watch arrangements

91 Arrangements for keeping a deck watch when the ship is in port shall at all times be adequate to:

.1 ensure the safety of life, of the ship, the port and the environment, and the safe operation of all machinery related to cargo operation;
.2 observe international, national and local rules; and
.3 maintain order and the normal routine of the ship.

92 The master shall decide the composition and duration of the deck watch depending on the conditions of mooring, type of the ship and character of duties.

93 If the master considers it necessary, a qualified officer shall be in charge of the deck watch.

94 The necessary equipment shall be so arranged as to provide for efficient watch-keeping.

95 The chief engineer officer, in consultation with the master, shall ensure that engineering watchkeeping arrangements are adequate to maintain a safe engineering watch while in port. When deciding the composition of the engineering watch, which may include appropriate engine-room ratings, the following points are among those to be taken into account:

.1 on all ships of 3,000 kW propulsion power and over there shall always be an officer in charge of the engineering watch;

.2 on ships of less than 3,000 kW propulsion power there may be, at the master's discretion and in consultation with the chief engineer officer, no officer in charge of the engineering watch; and

.3 officers, while in charge of an engineering watch, shall not be assigned or undertake any task or duty which would interfere with their supervisory duty in respect of the ship's machinery system.

Taking over the watch

96 Officers in charge of the deck or engineering watch shall not hand over the watch to their relieving officer if they have any reason to believe that the latter is obviously not capable of carrying out watchkeeping duties effectively, in which case the master or chief engineer shall be notified accordingly. Relieving officers of the deck or engineering watch shall ensure that all members of their watch are apparently fully capable of performing their duties effectively.

97 If, at the moment of handing over the deck or engineering watch, an important operation is being performed it shall be concluded by the officer being relieved, except when ordered otherwise by the master or chief engineer officer.

Part 4-1 – Taking over the deck watch

98 Prior to taking over the deck watch, the relieving officer shall be informed of the following by the officer in charge of the deck watch as to:

.1 the depth of the water at the berth, the ship's draught, the level and time of high and low waters; the securing of the moorings, the arrangement of anchors and the scope of the anchor chain, and other mooring features important to the safety of the ship; the state of main engines and their availability for emergency use;

.2 all work to be performed on board the ship; the nature, amount and disposition of cargo loaded or remaining, and any residue on board after unloading the ship;

.3 the level of water in bilges and ballast tanks;

.4 the signals or lights being exhibited or sounded;
.5 the number of crew members required to be on board and the presence of any other persons on board;
.6 the state of fire-fighting appliances;
.7 any special port regulations;
.8 the master's standing and special orders;
.9 the lines of communication available between the ship and shore personnel, including port authorities, in the event of an emergency arising or assistance being required;
.10 any other circumstances of importance to the safety of the ship, its crew, cargo or protection of the environment from pollution; and
.11 the procedures for notifying the appropriate authority of any environmental pollution resulting from ship activities.

99 Relieving officers, before assuming charge of the deck watch, shall verify that:
.1 the securing of moorings and anchor chain is adequate;
.2 the appropriate signals or lights are properly exhibited or sounded;
.3 safety measures and fire protection regulations are being maintained;
.4 they are aware of the nature of any hazardous or dangerous cargo being loaded or discharged and the appropriate action to be taken in the event of any spillage or fire;
.5 no external conditions or circumstances imperil the ship and that it does not imperil others.

Part 4-2 – Taking over the engineering watch

100 Prior to taking over the engineering watch, the relieving officer shall be informed by the officer in charge of the engineering watch as to:
.1 the standing orders of the day, any special orders relating to the ship operations, maintenance functions, repairs to the ship's machinery or control equipment;
.2 the nature of all work being performed on machinery and systems on board ship, personnel involved and potential hazards;
.3 the level and condition, where applicable, of water or residue in bilges, ballast tanks, slop tanks, sewage tanks, reserve tanks and special requirements for the use or disposal of the contents thereof
.4 any special requirements relating to sanitary system disposals;
.5 the condition and state of readiness of portable fire-extinguishing equipment and fixed fire-extinguishing installations and fire-detection systems;
.6 authorized repair personnel on board engaged in engineering activities, their work locations and repair functions and other authorized persons on board and the required crew;

.7 any port regulations pertaining to ship effluents, fire-fighting requirements and ship readiness, particularly during potential bad weather conditions;
.8 the lines of communication available between the ship and shore personnel, including port authorities, in the event of an emergency arising or assistance being required;
.9 any other circumstance of importance to the safety of the ship, its crew, cargo or the protection of the environment from pollution; and
.10 the procedures for notifying the appropriate authority of environmental pollution resulting from engineering activities.

101 Relieving officers, before assuming charge of the engineering watch, shall satisfy themselves that they are fully informed by the officer being relieved, as outlined above, and:

.1 be familiar with existing and potential sources of power, heat and lighting and their distribution;
.2 know the availability and condition of ship's fuel, lubricants and all water supplies; and
.3 be ready to prepare the ship and its machinery, as far as is possible, for stand-by or emergency conditions as required.

Part 4-3 – Performing the deck watch

102 The officer in charge of the deck watch shall:

.1 make rounds to inspect the ship at appropriate intervals;
.2 pay particular attention to:
.2.1 the condition and securing of the gangway, anchor chain and moorings, especially at the turn of the tide and in berths with a large rise and fall, if necessary, taking measures to ensure that they are in normal working condition,
.2.2 the draught, under-keel clearance and the general state of the ship, to avoid dangerous listing or trim during cargo handling or ballasting,
.2.3 the weather and sea state,
.2.4 the observance of all regulations concerning safety and fire protection,
.2.5 the water level in bilges and tanks,
.2.6 all persons on board and their location, especially those in remote or enclosed spaces, and
.2.7 the exhibition and sounding, where appropriate, of lights and signals;
.3 in bad weather, or on receiving a storm warning, take the necessary measures to protect the ship, persons on board and cargo;
.4 take every precaution to prevent pollution of the environment by the ship;

.5 in an emergency threatening the safety of the ship, raise the alarm, inform the master, take all possible measures to prevent any damage to the ship, its cargo and persons on board, and, if necessary, request assistance from the shore authorities or neighbouring ships;
.6 be aware of the ship's stability condition so that, in the event of fire, the shore fire-fighting authority may be advised of the approximate quantity of water that can be pumped on board without endangering the ship;
.7 offer assistance to ships or persons in distress;
.8 take necessary precautions to prevent accidents or damage when propellers are to be turned; and
.9 enter in the appropriate log-book all important events affecting the ship.

Part 4-4 – Performing the engineering watch

103 Officers in charge of the engineering watch shall pay particular attention to:
.1 the observance of all orders, special operating procedures and regulations concerning hazardous conditions and their prevention in all areas in their charge;
.2 the instrumentation and control systems, monitoring of all power supplies, components and systems in operation;
.3 the techniques, methods and procedures necessary to prevent violation of the pollution regulations of the local authorities, and
.4 the state of the bilges.

104 Officers in charge of the engineering watch shall:
.1 in emergencies, raise the alarm when in their opinion the situation so demands, and take all possible measures to prevent damage to the ship, persons on board and cargo;
.2 be aware of the deck officer's needs relating to the equipment required in the loading or unloading of the cargo and the additional requirements of the ballast and other ship stability control systems;
.3 make frequent rounds of inspection to determine possible equipment malfunction or failure, and take immediate remedial action to ensure the safety of the ship, of cargo operations, of the port and the environment;
.4 ensure that the necessary precautions are taken, within their area of responsibility, to prevent accidents or damage to the various electrical, electronic, hydraulic, pneumatic and mechanical systems of the ship;
.5 ensure that all important events affecting the operation, adjustment or repair of the ship's machinery are satisfactorily recorded.

Part 4-5 – Watch in port on ships carrying hazardous cargo

General

105 The master of every ship carrying cargo that is hazardous, whether explosive, flammable, toxic, health-threatening or environment-polluting, shall ensure that safe watchkeeping arrangements are maintained. On ships carrying hazardous cargo in bulk, this will be achieved by the ready availability on board of a duly qualified officer or officers, and ratings where appropriate even when the ship is safely moored or safely at anchor in port.

106 On ships carrying hazardous cargo other than in bulk, the master shall take full account of the nature, quantity, packing and stowage of the hazardous cargo and of any special conditions on board, afloat and ashore.

US Oil Pollution Act of 1990 (Selected Portions)

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PUBLIC LAW 101-380 [H.R. 1465]

AUGUST 18, 1990

OIL POLLUTION ACT OF 1990

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Note: The authors of this book have reproduced here selected relevant sections.

An Act

To establish limitations on liability for damages resulting from oil pollution, to establish a fund for the payment of compensation for such damages, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

[*1]
SECTION 1. <*33 USC 2701* note> SHORT TITLE.

This Act may be cited as the "Oil Pollution Act of 1990".

Oil Spills First Principles: Prevention and Best Response. Edited by B.E. Ornitz and M.A. Champ
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[*2]
SEC. 2. TABLE OF CONTENTS.

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Sec. 4105. Access to National Driver Register.
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TITLE I—OIL POLLUTION LIABILITY AND COMPENSATION
[*1001]
Sec. 1001. <*33 USC 2701*> DEFINITIONS.

For the purposes of this Act, the term

(1) "act of God" means an unanticipated grave natural disaster or other natural phenomenon of a exceptional, inevitable, and irresistible character the effects of which could not have been prevented or avoided by the exercise of due care or foresight;

(2) "barrel" means 42 United States gallons at 60 degrees fahrenheit;

(3) "claim" means a request, made in writing for a sum certain, for compensation for damages or removal costs resulting from an incident;

(4) "claimant" means any person or government who presents a claim for compensation under this title;

(5) "damages" means damages specified in section 1002(b) of this Act, and includes the cost of assessing these damages;

(6) "deepwater port" is a facility licensed under the Deepwater Port Act of 1974 (*33 USC 1501–1524*);

(7) "discharge" means any emission (other than natural seepage), intentional or unintentional, and includes, but is not limited to, spilling, leaking, pumping, pouring, emitting, emptying, or dumping;

(8) "exclusive economic zone" means the zone established by Presidential Proclamation Numbered 5030, dated March 10, 1983, including the ocean waters of the areas referred to as "eastern special areas" in Article 3(1) of the Agreement between the United States of America and the Union of Soviet Socialist Republics on the Maritime Boundary, signed June 1, 1990;

(9) "facility" means any structure, group of structures, equipment, or device (other than a vessel) which is used for one or more of the following purposes: exploring for, drilling for, producing, storing, handling, transferring, processing, or transporting oil. This term includes any motor vehicle, rolling stock, or pipeline used for one or more of these purposes;

(10) "foreign offshore unit" means a facility which is located, in whole or in part, in the territorial sea or on the continental shelf of a foreign country and which is or was used for one or more of the following purposes: exploring for, drilling for, producing, storing, handling, transferring, processing, or transporting oil produced from the seabed beneath the foreign country's territorial sea or from the foreign country's continental shelf;

(11) "Fund" means the Oil Spill Liability Trust Fund, established by section 9509 of the Internal Revenue Code of 1986 (*26 USC 9509*);

(12) "gross ton" has the meaning given that term by the Secretary under part J of title 46, United States Code;

[**487] (13) "guarantor" means any person, other than the responsible party, who provides evidence of financial responsibility for a responsible party under this Act;

(14) "incident" means any occurrence or series of occurrences having the same origin, involving one or more vessels, facilities, or any combination thereof, resulting in the discharge or substantial threat of discharge of oil;

(15) "Indian tribe" means any Indian tribe, band, nation, or other organized group or community, but not including any Alaska Native regional or village corporation, which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians and has governmental authority over lands belonging to or controlled by the tribe;

(16) "lessee" means a person holding a leasehold interest in an oil or gas lease on lands beneath navigable waters (as that term is defined in section 2(a) of the Submerged Lands Act (*43 USC 1301*(a))) or on submerged lands of the Outer Continental Shelf, granted or maintained under applicable State law or the Outer Continental Shelf Lands Act (*43 USC 1331 et seq.*);

(17) "liable" or "liability" shall be construed to be the standard of liability which obtains under section 311 of the Federal Water Pollution Control Act (*33 USC 1321*);

(18) "mobile offshore drilling unit" means a vessel (other than a self-elevating lift vessel) capable of use as an offshore facility;

(19) "National Contingency Plan" means the National Contingency Plan prepared and published under section 311(d) of the Federal Water Pollution Control Act, as amended by this Act, or revised under section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act (*42 USC 9605*);

(20) "natural resources" includes land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States (including the resources of the exclusive economic zone), any State or local government or Indian tribe, or any foreign government;

(21) "navigable waters" means the waters of the United States, including the territorial sea;

(22) "offshore facility" means any facility of any kind located in, on, or under any of the navigable waters of the United States, and any facility of any kind which is subject to the jurisdiction of the United States and is located in, on, or under any other waters, other than a vessel or a public vessel;

(23) "oil" means oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil, but does not include petroleum, including crude oil or any fraction thereof, which is specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (*42 USC 9601*) and which is subject to the provisions of that Act;

(24) "onshore facility" means any facility (including, but not limited to, motor vehicles and rolling stock) of any kind located in, on, or under, any land within the United States other than submerged land;

[**488] (25) the term "Outer Continental Shelf facility" means an offshore facility which is located, in whole or in part, on the Outer Continental Shelf and is or was used for one or more of the following purposes: exploring for, drilling for, producing, stor-

ing, handling, transferring, processing, or transporting oil produced from the Outer Continental Shelf;

(26) "owner or operator" means (A) in the case of a vessel, any person owning, operating, or chartering by demise, the vessel, and (B) in the case of an onshore facility, and an offshore facility, any person owning or operating such onshore facility or offshore facility, and (C) in the case of any abandoned offshore facility, the person who owned or operated such facility immediately prior to such abandonment;

(27) "person" means an individual, corporation, partnership, association, State, municipality, commission, or political subdivision of a State, or any interstate body;

(28) "permittee" means a person holding an authorization, license, or permit for geological exploration issued under section 11 of the Outer Continental Shelf Lands Act (*43 USC 1340*) or applicable State law;

(29) "public vessel" means a vessel owned or bareboat chartered and operated by the United States, or by a State or political subdivision thereof, or by a foreign nation, except when the vessel is engaged in commerce;

(30) "remove" or "removal" means containment and removal of oil or a hazardous substance from water and shorelines or the taking of other actions as may be necessary to minimize or mitigate damage to the public health or welfare, including, but not limited to, fish, shellfish, wildlife, and public and private property, shorelines, and beaches;

(31) "removal costs" means the costs of removal that are incurred after a discharge of oil has occurred or, in any case in which there is a substantial threat of a discharge of oil, the costs to prevent, minimize, or mitigate oil pollution from such an incident;

(32) "responsible party" means the following:

(A) VESSELS.—In the case of a vessel, any person owning, operating, or demise chartering the vessel.

(B) ONSHORE FACILITIES.—In the case of an onshore facility (other than a pipeline), any person owning or operating the facility, except a Federal agency, State, municipality, commission, or political subdivision of a State, or any interstate body, that as the owner transfers possession and right to use the property to another person by lease, assignment, or permit.

(C) OFFSHORE FACILITIES.—In the case of an offshore facility (other than a pipeline or a deepwater port licensed under the Deepwater Port Act of 1974 (*33 USC 1501* et seq.)), the lessee or permittee of the area in which the facility is located or the holder of a right of use and easement granted under applicable State law or the Outer Continental Shelf Lands Act (*43 USC 1301–1356*) for the area in which the facility is located (if the holder is a different person than the lessee or permittee), except a Federal agency, State, municipality, commission, or political subdivision of a State, or any interstate body, that as [**489] owner transfers possession and right to use the property to another person by lease, assignment, or permit.

(D) DEEPWATER PORTS.—In the case of a deepwater port licensed under the Deepwater Port Act of 1974 (*33 USC 1501–1524*), the licensee.

(E) PIPELINES.—In the case of a pipeline, any person owning or operating the pipeline.

(F) ABANDONMENT.—In the case of an abandoned vessel, onshore facility, deepwater port, pipeline, or offshore facility, the persons who would have been responsible parties immediately prior to the abandonment of the vessel or facility.

(33) "Secretary" means the Secretary of the department in which the Coast Guard is operating;

(34) "tank vessel" means a vessel that is constructed or adapted to carry, or that carries, oil or hazardous material in bulk as cargo or cargo residue, and that

(A) is a vessel of the United States;

(B) operates on the navigable waters; or

(C) transfers oil or hazardous material in a place subject to the jurisdiction of the United States;

(35) "territorial seas" means the belt of the seas measured from the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters, and extending seaward a distance of 3 miles;

(36) "United States" and "State" mean the several States of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Commonwealth of the Northern Marianas, and any other territory or possession of the United States; and

(37) "vessel" means every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water, other than a public vessel.

[*1002]

SEC. 1002. <*33 USC 2702*> ELEMENTS OF LIABILITY.

(a) IN GENERAL. – Notwithstanding any other provision or rule of law, and subject to the provisions of this Act, each responsible party for a vessel or a facility from which oil is discharged, or which poses the substantial threat of a discharge of oil, into or upon the navigable waters or adjoining shorelines or the exclusive economic zone is liable for the removal costs and damages specified in subsection (b) that result from such incident.

(b) COVERED REMOVAL COSTS AND DAMAGES.

(1) REMOVAL COSTS.—The removal costs referred to in subsection (a) are

(A) all removal costs incurred by the United States, a State, or an Indian tribe under subsection (c), (d), (e), or (1) of section 311 of the Federal Water Pollution Control Act (*33 USC 1321*), as amended by this Act, under the Intervention on the High Seas Act (*33 USC 1471* et seq.), or under State law; and

(B) any removal costs incurred by any person for acts taken by the person which are consistent with the National Contingency Plan.

(2) DAMAGES.—The damages referred to in subsection (a) are the following:

[**490] (A) NATURAL RESOURCES.—Damages for injury to, destruction of, loss of, or loss of use of, natural resources, including the reasonable costs of assessing the damage, which shall be recoverable by a United States trustee, a State trustee, an Indian tribe trustee, or a foreign trustee.

(B) REAL OR PERSONAL PROPERTY.—Damages for injury to, or economic losses resulting from destruction of, real or personal property, which shall be recoverable by a claimant who owns or leases that property.

(C) SUBSISTENCE USE.—Damages for loss of subsistence use of natural resources, which shall be recoverable by any claimant who so uses natural resources which have been injured, destroyed, or lost, without regard to the ownership or management of the resources.

(D) REVENUES.—Damages equal to the net loss of taxes, royalties, rents, fees, or net profit shares due to the injury, destruction, or loss of real property, personal property, or natural resources, which shall be recoverable by the Government of the United States, a State, or a political subdivision thereof.

(E) PROFITS AND EARNING CAPACITY.—Damages equal to the loss of profits or impairment of earning capacity due to the injury, destruction, or loss of real property, personal property, or natural resources, which shall be recoverable by any claimant.

(F) PUBLIC SERVICES.—Damages for net costs of providing increased or additional public services during or after removal activities, including protection from fire, safety, or health hazards, caused by a discharge of oil, which shall be recoverable by a State, or a political subdivision of a State.

(c) EXCLUDED DISCHARGES.—This title does not apply to any discharge

(1) permitted by a permit issued under Federal, State, or local law;

(2) from a public vessel; or

(3) from an onshore facility which is subject to the Trans-Alaska Pipeline Authorization Act (*43 USC 1651* et seq.).

(d) LIABILITY OF THIRD PARTIES.

(1) IN GENERAL.

(A) THIRD PARTY TREATED AS RESPONSIBLE PARTY.—Except as provided in subparagraph (B), in any case in which a responsible party establishes that a discharge or threat of a discharge and the resulting removal costs and damages were caused solely by an act or omission of one or more third parties described in section 1003(a)(3) (or solely by such an act or omission in combination with an act of God or an act of war), the third party or parties shall be treated as the responsible party or parties for purposes of determining liability under this title.

(B) SUBROGATION OF RESPONSIBLE PARTY.—If the responsible party alleges that the discharge or threat of a discharge was caused solely by an act or omission of a third party, the responsible party

(i) in accordance with section 1013, shall pay removal costs and damages to any claimant; and

(ii) shall be entitled by subrogation to all rights of the United States Government and the claimant to recover [**491] removal costs or damages from the third party or the Fund paid under this subsection.

(2) LIMITATION APPLIED.

(A) OWNER OR OPERATOR OF VESSEL OR FACILITY.—If the act or omission of a third party that causes an incident occurs in connection with a vessel or facility owned or operated by the third party, the liability of the third party shall be subject to the limits provided in section 1004 as applied with respect to the vessel or facility.

(B) OTHER CASES.—In any other case, the liability of a third party or parties shall not exceed the limitation which would have been applicable to the responsible party of the vessel or facility from which the discharge actually occurred if the responsible party were liable.

[*1003]
SEC. 1003. <*33 USC 2703*> DEFENSES TO LIABILITY.

(a) COMPLETE DEFENSES.—A responsible party is not liable for removal costs or damages under section 1002 if the responsible party establishes, by a preponderance of the evidence, that the discharge or substantial threat of a discharge of oil and the resulting damages or removal costs were caused solely by:

(1) an act of God;

(2) an act of war;

(3) an act or omission of a third party, other than an employee or agent of the responsible party or a third party whose act or omission occurs in connection with any contractual relationship with the responsible party (except where the sole contractual arrangement arises in connection with carriage by a common carrier by rail), if the responsible party establishes, by a preponderance of the evidence, that the responsible party

(A) exercised due care with respect to the oil concerned, taking into consideration the characteristics of the oil and in light of all relevant facts and circumstances; and

(B) took precautions against foreseeable acts or omissions of any such third party and the foreseeable consequences of those acts or omissions; or

(4) any combination of paragraphs (1), (2), and (3).

(b) DEFENSES AS TO PARTICULAR CLAIMANTS.—A responsible party is not liable under section 1002 to a claimant, to the extent that the incident is caused by the

gross negligence or wilful misconduct of the claimant.

(c) LIMITATION ON COMPLETE DEFENSE.—Subsection (a) does not apply with respect to a responsible party who fails or refuses

(1) to report the incident as required by law if the responsible party knows or has reason to know of the incident;

(2) to provide all reasonable cooperation and assistance requested by a responsible official in connection with removal activities; or

(3) without sufficient cause, to comply with an order issued under subsection (c) or (e) of section 311 of the Federal Water Pollution Control Act (*33 USC 1321*), as amended by this Act, or the Intervention on the High Seas Act (*33 USC 1471* et seq.).

[*1004]
SEC. 1004. <*33 USC 2704*> LIMITS ON LIABILITY.

(a) GENERAL RULE.—Except as otherwise provided in this section, the total of the liability of a responsible party under section 1002 [**492] and any removal costs incurred by, or on behalf of, the responsible party, with respect to each incident shall not exceed

(1) for a tank vessel, the greater of

(A) $1,200 per gross ton; or

(B)(i) in the case of a vessel greater than 3,000 gross tons, $10,000,000; or

(ii) in the case of a vessel of 3,000 gross tons or less, $2,000,000;

(2) for any other vessel, $600 per gross ton or $500,000, whichever is greater;

(3) for an offshore facility except a deepwater port, the total of all removal costs plus $75,000,000; and

(4) for any onshore facility and a deepwater port, $350,000,000.

(b) DIVISION OF LIABILITY FOR MOBILE OFFSHORE DRILLING UNITS.

(1) TREATED FIRST AS TANK VESSEL.—For purposes of determining the responsible party and applying this Act and except as provided in paragraph (2), a mobile offshore drilling unit which is being used as an offshore facility is deemed to be a tank vessel with respect to the discharge, or the substantial threat of a discharge, of oil on or above the surface of the water.

(2) TREATED AS FACILITY FOR EXCESS LIABILITY.—To the extent that removal costs and damages from any incident described in paragraph (1) exceed the amount for which a responsible party is liable (as that amount may be limited under subsection (a)(1)), the mobile offshore drilling unit is deemed to be an offshore facility. For purposes of applying subsection (a)(3), the amount specified in that subsection shall be reduced by the amount for which the responsible party is liable under paragraph (1).

(c) EXCEPTIONS.

(1) ACTS OF RESPONSIBLE PARTY.—Subsection (a) does not apply if the incident was proximately caused by:

(A) gross negligence or willful misconduct of, or

(B) the violation of an applicable Federal safety, construction, or operating regulation by, the responsible party, an agent or employee of the responsible party, or a person acting pursuant to a contractual relationship with the responsible party (except where the sole contractual arrangement arises in connection with carriage by a common carrier by rail).

(2) FAILURE OR REFUSAL OF RESPONSIBLE PARTY.—Subsection (a) does not apply if the responsible party fails or refuses

(A) to report the incident as required by law and the responsible party knows or has reason to know of the incident;

(B) to provide all reasonable cooperation and assistance requested by a responsible official in connection with removal activities; or

(C) without sufficient cause, to comply with an order issued under subsection (c) or (e) of section 311 of the Federal Water Pollution Control Act (*33 USC 1321*), as amended by this Act, or the Intervention on the High Seas Act (*33 USC 1471* et seq.).

(3) OCS FACILITY OR VESSEL.—Notwithstanding the limitations established under subsection (a) and the defenses of section 1003, all removal costs incurred by the United States Government or any State or local official or agency in connection with a discharge or substantial threat of a discharge of oil from any [**493] Outer Continental Shelf facility or a vessel carrying oil as cargo from such a facility shall be borne by the owner or operator of such facility or vessel.

(d) ADJUSTING LIMITS OF LIABILITY.

(1) ONSHORE FACILITIES.—Subject to paragraph (2), the President may establish by regulation, with respect to any class or category of onshore facility, a limit of liability under this section of less than $350,000,000, but not less than $8,000,000, taking into account size, storage capacity, oil throughput, proximity to sensitive areas, type of oil handled, history of discharges, and other factors relevant to risks posed by the class or category of facility.

(2) DEEPWATER PORTS AND ASSOCIATED VESSELS.

(A) STUDY.—The Secretary shall conduct a study of the relative operational and environmental risks posed by the transportation of oil by vessel to deepwater ports (as defined in section 3 of the Deepwater Port Act of 1974 (*33 USC 1502*)) versus the transportation of oil by vessel to other ports. The study shall include a review and analysis of offshore lightering practices used in connection with that transportation, an analysis of the volume of oil transported by vessel using those practices, and an analysis of the frequency and volume of oil discharges which occur in connection with the use of those practices.

(B) REPORT.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall submit to the Congress a report on the results of the study conducted under subparagraph (A).

(C) RULEMAKING PROCEEDING.—If the Secretary determines, based on the results of the study conducted under this subparagraph (A), that the use of deepwater ports in connection with the transportation of oil by vessel results in a lower operational or environmental risk than the use on other ports, the Secretary shall initiate, not later than the 180th day following the date of submission of the report to the Congress under subparagraph (B), a rulemaking proceeding to lower the limits of liability under this section for deepwater ports as the Secretary determines appropriate. The Secretary may establish a limit of liability of less than $350,000,000, but not less than $50,000,000, in accordance with paragraph (1).

(3) PERIODIC REPORTS.—The President shall, within 6 months after the date of the enactment of this Act, and from time to time thereafter, report to the Congress on the desirability of adjusting the limits of liability specified in subsection (a).

(4) ADJUSTMENT TO REFLECT CONSUMER PRICE INDEX.—The President shall, by regulations issued not less often than every 3 years, adjust the limits of liability specified in subsection (a) to reflect significant increases in the Consumer Price Index.

[*1005]
SEC. 1005. <*33 USC 2705*> INTEREST.

(a) GENERAL RULE.—The responsible party or the responsible party's guarantor is liable to a claimant for interest on the amount paid in satisfaction of a claim under this Act for the period described in subsection (b).

(b) PERIOD.

[**494] (1) IN GENERAL.—Except as provided in paragraph (2), the period for which interest shall be paid is the period beginning on the 30th day following the date on which the claim is presented to the responsible party or guarantor and ending on the date on which the claim is paid.

(2) EXCLUSION OF PERIOD DUE TO OFFER BY GUARANTOR.—If the guarantor offers to the claimant an amount equal to or greater than that finally paid in satisfaction of the claim, the period described in paragraph (1) does not include the period beginning on the date the offer is made and ending on the date the offer is accepted. If the offer is made within 60 days after the date on which the claim is presented under section 1013(a), the period described in paragraph (1) does not include any period before the offer is accepted.

(3) EXCLUSION OF PERIODS IN INTERESTS OF JUSTICE.—If in any period a claimant is not paid due to reasons beyond the control of the responsible party or

because it would not serve the interests of justice, no interest shall accrue under this section during that period.

(4) CALCULATION OF INTEREST.—The interest paid under this section shall be calculated at the average of the highest rate for commercial and finance company paper of maturities of 180 days or less obtaining on each of the days included within the period for which interest must be paid to the claimant, as published in the Federal Reserve Bulletin.

(5) INTEREST NOT SUBJECT TO LIABILITY LIMITS.

(A) IN GENERAL.—Interest (including prejudgment interest) under this paragraph is in addition to damages and removal costs for which claims may be asserted under section 1002 and shall be paid without regard to any limitation of liability under section 1004.

(B) PAYMENT BY GUARANTOR.—The payment of interest under this subsection by a guarantor is subject to section 1016(g).

[*1006]
SEC. 1006. <*33 USC 2706*> NATURAL RESOURCES.

(a) LIABILITY.—In the case of natural resource damages under section 1002(b)(2)(A), liability shall be

(1) to the United States Government for natural resources belonging to, managed by, controlled by, or appertaining to the United States;

(2) to any State for natural resources belonging to, managed by, controlled by, or appertaining to such State or political subdivision thereof;

(3) to any Indian tribe for natural resources belonging to, managed by, controlled by, or appertaining to such Indian tribe; and

(4) in any case in which section 1007 applies, to the government of a foreign country for natural resources belonging to, managed by, controlled by, or appertaining to such country.

(b) DESIGNATION OF TRUSTEES.

(1) IN GENERAL.—The President, or the authorized representative of any State, Indian tribe, or foreign government, shall act on behalf of the public, Indian tribe, or foreign country as trustee of natural resources to present a claim for and to recover damages to the natural resources.

[**495] (2) FEDERAL TRUSTEES.—The President shall designate the Federal officials who shall act on behalf of the public as trustees for natural resources under this Act.

(3) STATE TRUSTEES.—The Governor of each State shall designate State and local officials who may act on behalf of the public as trustee for natural resources under this Act and shall notify the President of the designation.

(4) INDIAN TRIBE TRUSTEES.—The governing body of any Indian tribe shall designate tribal officials who may act on behalf of the tribe or its members as trustee for natural resources under this Act and shall notify the President of the designation.

(5) FOREIGN TRUSTEES.—The head of any foreign government may designate the trustee who shall act on behalf of that government as trustee for natural resources under this Act.

(c) FUNCTIONS OF TRUSTEES.

(1) FEDERAL TRUSTEES.—The Federal officials designated under subsection (b)(2)

(A) shall assess natural resource damages under section 1002(b)(2)(A) for the natural resources under their trusteeship;

(B) may, upon request of and reimbursement from a State or Indian tribe and at the Federal officials' discretion, assess damages for the natural resources under the State's or tribe's trusteeship; and

(C) shall develop and implement a plan for the restoration, rehabilitation, replacement, or acquisition of the equivalent, of the natural resources under their trusteeship.

(2) STATE TRUSTEES.—The State and local officials designated under subsection (b)(3)

(A) shall assess natural resource damages under section 1002(b)(2)(A) for the purposes of this Act for the natural resources under their trusteeship; and

(B) shall develop and implement a plan for the restoration, rehabilitation, replacement, or acquisition of the equivalent, of the natural resources under their trusteeship.

(3) INDIAN TRIBE TRUSTEES.—The tribal officials designated under subsection (b)(4)

(A) shall assess natural resource damages under section 1002(b)(2)(A) for the purposes of this Act for the natural resources under their trusteeship; and

(B) shall develop and implement a plan for the restoration, rehabilitation, replacement, or acquisition of the equivalent, of the natural resources under their trusteeship.

(4) FOREIGN TRUSTEES.—The trustees designated under subsection (b)(5)

(A) shall assess natural resource damages under section 1002(b)(2)(A) for the purposes of this Act for the natural resources under their trusteeship; and

(B) shall develop and implement a plan for the restoration, rehabilitation, replacement, or acquisition of the equivalent, of the natural resources under their trusteeship.

(5) NOTICE AND OPPORTUNITY TO BE HEARD.—Plans shall be developed and implemented under this section only after adequate [**496] public notice, opportunity for a hearing, and consideration of all public comment.

(d) MEASURE OF DAMAGES.

(1) IN GENERAL.—The measure of natural resource damages under section 1002(b)(2)(A) is

(A) the cost of restoring, rehabilitating, replacing, or acquiring the equivalent of, the damaged natural resources;

(B) the diminution in value of those natural resources pending restoration; plus

(C) the reasonable cost of assessing those damages.

(2) DETERMINE COSTS WITH RESPECT TO PLANS.—Costs shall be determined under paragraph (1) with respect to plans adopted under subsection (c).

(3) NO DOUBLE RECOVERY.—There shall be no double recovery under this Act for natural resource damages, including with respect to the costs of damage assessment or restoration, rehabilitation, replacement, or acquisition for the same incident and natural resource.

(e) DAMAGE ASSESSMENT REGULATIONS.

(1) REGULATIONS.—The President, acting through the Under Secretary of Commerce for Oceans and Atmosphere and in consultation with the Administrator of the Environmental Protection Agency, the Director of the United States Fish and Wildlife Service, and the heads of other affected agencies, not later than 2 years after the date of the enactment of this Act, shall promulgate regulations for the assessment of natural resource damages under section 1002(b)(2)(A) resulting from a discharge of oil for the purpose of this Act.

(2) REBUTTABLE PRESUMPTION.—Any determination or assessment of damages to natural resources for the purposes of this Act made under subsection (d) by a Federal, State, or Indian trustee in accordance with the regulations promulgated under paragraph (1) shall have the force and effect of a rebuttable presumption on behalf of the trustee in any administrative or judicial proceeding under this Act.

(f) USE OF RECOVERED SUMS.—Sums recovered under this Act by a Federal, State, Indian, or foreign trustee for natural resource damages under section 1002(b)(2)(A) shall be retained by the trustee in a revolving trust account, without further appropriation, for use only to reimburse or pay costs incurred by the trustee under subsection (c) with respect to the damaged natural resources. Any amounts in excess of those required for these reimbursements and costs shall be deposited in the Fund.

(g) COMPLIANCE.—Review of actions by any Federal official where there is alleged to be a failure of that official to perform a duty under this section that is not discretionary with that official may be had by any person in the district court in which the person resides or in which the alleged damage to natural resources occurred. The court may award costs of litigation (including reasonable attorney and expert witness fees) to any prevailing or substantially prevailing party. Nothing in this subsection shall restrict any right which any person may have to seek relief under any other provision of law.

[*1007]
SEC. 1007. <*33 USC 2707*> RECOVERY BY FOREIGN CLAIMANTS.

(a) REQUIRED SHOWING BY FOREIGN CLAIMANTS.

[**497] (1) IN GENERAL.—In addition to satisfying the other requirements of this Act, to recover removal costs or damages resulting from an incident a foreign claimant shall demonstrate that

(A) the claimant has not been otherwise compensated for the removal costs or damages; and

(B) recovery is authorized by a treaty or executive agreement between the United States and the claimant's country, or the Secretary of State, in consultation with the Attorney General and other appropriate officials, has certified that the claimant's country provides a comparable remedy for United States claimants.

(2) EXCEPTIONS.—Paragraph (1)(B) shall not apply with respect to recovery by a resident of Canada in the case of an incident described in subsection (b)(4).

(b) DISCHARGES IN FOREIGN COUNTRIES.—A foreign claimant may make a claim for removal costs and damages resulting from a discharge, or substantial threat of a discharge, of oil in or on the territorial sea, internal waters, or adjacent shoreline of a foreign country, only if the discharge is from

(1) an Outer Continental Shelf facility or a deepwater port;

(2) a vessel in the navigable waters;

(3) a vessel carrying oil as cargo between 2 places in the United States; or

(4) a tanker that received the oil at the terminal of the pipeline constructed under the Trans-Alaska Pipeline Authorization Act (*43 USC 1651* et seq.), for transportation to a place in the United States, and the discharge or threat occurs prior to delivery of the oil to that place.

(c) FOREIGN CLAIMANT DEFINED.—In this section, the term "foreign claimant" means

(1) a person residing in a foreign country;

(2) the government of a foreign country; and

(3) an agency or political subdivision of a foreign country.

[*1008]
SEC. 1008. <*33 USC 2708*> RECOVERY BY RESPONSIBLE PARTY.

(a) IN GENERAL.—The responsible party for a vessel or facility from which oil is discharged, or which poses the substantial threat of a discharge of oil, may assert a claim for removal costs and damages under section 1013 only if the responsible party demonstrates that

(1) the responsible party is entitled to a defense to liability under section 1003; or

(2) the responsible party is entitled to a limitation of liability under section 1004.

(b) EXTENT OF RECOVERY.—A responsible party who is entitled to a limitation of liability may assert a claim under section 1013 only to the extent that the sum of the removal costs and damages incurred by the responsible party plus the amounts paid by the responsible party, or by the guarantor on behalf of the responsible party, for claims asserted under section 1013 exceeds the amount to which the total of the liability under section 1002 and removal costs and damages incurred by, or on behalf of, the responsible party is limited under section 1004.

[*1009]
SEC. 1009. <*33 USC 2709*> CONTRIBUTION.

A person may bring a civil action for contribution against any other person who is liable or potentially liable under this Act or [**498] another law. The action shall be brought in accordance with section 1017.

[*1010]
SEC. 1010. <*23 USC 2710*> INDEMNIFICATION AGREEMENTS.

(a) AGREEMENTS NOT PROHIBITED.—Nothing in this Act prohibits any agreement to insure, hold harmless, or indemnify a party to such agreement for any liability under this Act.

(b) LIABILITY NOT TRANSFERRED.—No indemnification, hold harmless, or similar agreement or conveyance shall be effective to transfer liability imposed under this Act from a responsible party or from any person who may be liable for an incident under this Act to any other person.

(c) RELATIONSHIP TO OTHER CAUSES OF ACTION.—Nothing in this Act, including the provisions of subsection (b), bars a cause of action that a responsible party subject to liability under this Act, or a guarantor, has or would have, by reason of subrogation or otherwise, against any person.

[*1011]
SEC. 1011. <*33 USC 2711*> CONSULTATION ON REMOVAL ACTIONS.

The President shall consult with the affected trustees designated under section 1006 on the appropriate removal action to be taken in connection with any discharge of oil. For the purposes of the National Contingency Plan, removal with respect to any discharge shall be considered completed when so determined by the President in consultation with the Governor or Governors of the affected States. However, this determination

shall not preclude additional removal actions under applicable State law.

[*1012]
SEC. 1012. <*33 USC 2712*> USES OF THE FUND.

(a) USES GENERALLY.—The Fund shall be available to the President for

(1) the payment of removal costs, including the costs of monitoring removal actions, determined by the President to be consistent with the National Contingency Plan

(A) by Federal authorities; or

(B) by a Governor or designated State official under subsection (d);

(2) the payment of costs incurred by Federal, State, or Indian tribe trustees in carrying out their functions under section 1006 for assessing natural resource damages and for developing and implementing plans for the restoration, rehabilitation, replacement, or acquisition of the equivalent of damaged resources determined by the President to be consistent with the National Contingency Plan;

(3) the payment of removal costs determined by the President to be consistent with the National Contingency Plan as a result of, and damages resulting from, a discharge, or a substantial threat of a discharge, of oil from a foreign offshore unit;

(4) the payment of claims in accordance with section 1013 for uncompensated removal costs determined by the President to be consistent with the National Contingency Plan or uncompensated damages;

(5) the payment of Federal administrative, operational, and personnel costs and expenses reasonably necessary for and incidental to the implementation, administration, and enforcement of this Act (including, but not limited to, sections 1004(d)(2), 1006(e), 4107, 4110, 4111, 4112, 4117, 5006, 8103, and [**499] title VII) and subsections (b), (c), (d), (j), and (l) of section 311 of the Federal Water Pollution Control Act (*33 USC 1321*) as amended by this Act, with respect to prevention, removal, and enforcement related to oil discharges, provided that

(A) not more than $25,000,000 in each fiscal year shall be available to the Secretary for operating expenses incurred by the Coast Guard;

(B) not more than $30,000,000 each year through the end of fiscal year 1992 shall be available to establish the National Response System under section 311(j) of the Federal Water Pollution Control Act, as amended by this Act, including the purchase and prepositioning of oil spill removal equipment; and

(C) not more than $27,250,000 in each fiscal year shall be available to carry out title VII of this Act.

(b) DEFENSE TO LIABILITY FOR FUND.—The Fund shall not be available to pay any claim for removal costs or damages to a particular claimant, to the extent that the incident, removal costs, or damages are caused by the gross negligence or willful misconduct of that claimant.

(c) OBLIGATION OF FUND BY FEDERAL OFFICIALS.—The President may promulgate regulations designating one or more Federal officials who may obligate money in accordance with subsection (a).

(d) ACCESS TO FUND BY STATE OFFICIALS.

(1) IMMEDIATE REMOVAL.—In accordance with regulations promulgated under this section, the President, upon the request of the Governor of a State or pursuant to an agreement with a State under paragraph (2), may obligate the Fund for payment in an amount not to exceed $250,000 for removal costs consistent with the National Contingency Plan required for the immediate removal of a discharge, or the mitigation or prevention of a substantial threat of a discharge, of oil.

(2) AGREEMENTS.

(A) IN GENERAL.—The President shall enter into an agreement with the Governor of any interested State to establish procedures under which the Governor or a designated State official may receive payments from the Fund for removal costs pursuant to paragraph (1).

(B) TERMS.—Agreements under this paragraph

(i) may include such terms and conditions as may be agreed upon by the President and the Governor of a State;

(ii) shall provide for political subdivisions of the State to receive payments for reasonable removal costs; and

(iii) may authorize advance payments from the Fund to facilitate removal efforts.

(e) REGULATIONS.—The President shall

(1) not later than 6 months after the date of the enactment of this Act, publish proposed regulations detailing the manner in which the authority to obligate the Fund and to enter into agreements under this subsection shall be exercised; and

(2) not later than 3 months after the close of the comment period for such proposed regulations, promulgate final regulations for that purpose.

(f) RIGHTS OF SUBROGATION.—Payment of any claim or obligation by the Fund under this Act shall be subject to the United States [**500] Government acquiring by subrogation all rights of the claimant or State to recover from the responsible party.

(g) AUDITS.—The Comptroller General shall audit all payments, obligations, reimbursements, and other uses of the Fund, to assure that the Fund is being properly administered and that claims are being appropriately and expeditiously considered. The Comptroller General shall submit to the Congress an interim report one year after the date of the enactment of this Act. The Comptroller General shall thereafter audit the Fund as is appropriate. Each Federal agency shall cooperate with the Comptroller General in carrying out this subsection.

(h) PERIOD OF LIMITATIONS FOR CLAIMS.

(1) REMOVAL COSTS.—No claim may be presented under this title for recovery of removal costs for an incident unless the claim is presented within 6 years after the date of completion of all removal actions for that incident.

(2) DAMAGES.—No claim may be presented under this section for recovery of damages unless the claim is presented within 3 years after the date on which the injury and its connection with the discharge in question were reasonably discoverable with the exercise of due care, or in the case of natural resource damages under section 1002(b)(2)(A), if later, the date of completion of the natural resources damage assessment under section 1006(e).

(3) MINORS AND INCOMPETENTS.—The time limitations contained in this subsection shall not begin to run

(A) against a minor until the earlier of the date when such minor reaches 18 years of age or the date on which a legal representative is duly appointed for the minor, or

(B) against an incompetent person until the earlier of the date on which such incompetent's incompetency ends or the date on which a legal representative is duly appointed for the incompetent.

(i) LIMITATION ON PAYMENT FOR SAME COSTS.—In any case in which the President has paid an amount from the Fund for any removal costs or damages specified under subsection (a), no other claim may be paid from the Fund for the same removal costs or damages.

(j) OBLIGATION IN ACCORDANCE WITH PLAN.

(1) IN GENERAL.—Except as provided in paragraph (2), amounts may be obligated from the Fund for the restoration, rehabilitation, replacement, or acquisition of natural resources only in accordance with a plan adopted under section 1006(c).

(2) EXCEPTION.—Paragraph (1) shall not apply in a situation requiring action to avoid irreversible loss of natural resources or to prevent or reduce any continuing danger to natural resources or similar need for emergency action.

(k) PREFERENCE FOR PRIVATE PERSONS IN AREA AFFECTED BY DISCHARGE.

(1) IN GENERAL.—In the expenditure of Federal funds for removal of oil, including for distribution of supplies, construction, and other reasonable and appropriate activities, under a contract or agreement with a private person, preference shall be given, to the extent feasible and practicable, to private persons residing or doing business primarily in the area affected by the discharge of oil.

(2) LIMITATION.—This subsection shall not be considered to restrict the use of Department of Defense resources.

[**501] [*1013]
SEC. 1013. <*33 USC 2713*> CLAIMS PROCEDURE.

(a) PRESENTATION.—Except as provided in subsection (b), all claims for removal costs or damages shall be presented first to the responsible party or guarantor of the source designated under section 1014(a).

(b) PRESENTATION TO FUND.

(1) IN GENERAL.—Claims for removal costs or damages may be presented first to the Fund

(A) if the President has advertised or otherwise notified claimants in accordance with section 1014(c);

(B) by a responsible party who may assert a claim under section 1008;

(C) by the Governor of a State for removal costs incurred by that State; or

(D) by a United States claimant in a case where a foreign offshore unit has discharged oil causing damage for which the Fund is liable under section 1012(a).

(2) LIMITATION ON PRESENTING CLAIM.—No claim of a person against the Fund may be approved or certified during the pendency of an action by the person in court to recover costs which are the subject of the claim.

(c) ELECTION.—If a claim is presented in accordance with subsection (a) and –

(1) each person to whom the claim is presented denies all liability for the claim, or

(2) the claim is not settled by any person by payment within 90 days after the date upon which (A) the claim was presented, or (B) advertising was begun pursuant to section 1014(b), whichever is later, the claimant may elect to commence an action in court against the responsible party or guarantor or to present the claim to the Fund.

(d) UNCOMPENSATED DAMAGES.—If a claim is presented in accordance with this section and full and adequate compensation is unavailable, a claim for the uncompensated damages and removal costs may be presented to the Fund.

(e) PROCEDURE FOR CLAIMS AGAINST FUND.—The President shall promulgate, and may from time to time amend, regulations for the presentation, filing, processing, settlement, and adjudication of claims under this Act against the Fund.

[*1014]
SEC. 1014. <*33 USC 2714*> DESIGNATION OF SOURCE AND ADVERTISEMENT.

(a) DESIGNATION OF SOURCE AND NOTIFICATION.—When the President receives information of an incident, the President shall, where possible and appropriate, designate the source or sources of the discharge or threat. If a designated source is a vessel or a facility, the President shall immediately notify the responsible party and

the guarantor, if known, of that designation.

(b) ADVERTISEMENT BY RESPONSIBLE PARTY OR GUARANTOR.—If a responsible party or guarantor fails to inform the President, within 5 days after receiving notification of a designation under subsection (a), of the party's or the guarantor's denial of the designation, such party or guarantor shall advertise the designation and the procedures by which claims may be presented, in accordance with regulations promulgated by the President. Advertisement under the preceding sentence shall begin no later than 15 days after the date of the designation made under subsection (a). If advertisement is not otherwise made in accordance with this subsection, the President [**502] shall promptly and at the expense of the responsible party or the guarantor involved, advertise the designation and the procedures by which claims may be presented to the responsible party or guarantor. Advertisement under this subsection shall continue for a period of no less than 30 days.

(c) ADVERTISEMENT BY PRESIDENT.—If

(1) the responsible party and the guarantor both deny a designation within 5 days after receiving notification of a designation under subsection (a),

(2) the source of the discharge or threat was a public vessel, or

(3) the President is unable to designate the source or sources of the discharge or threat under subsection (a), the President shall advertise or otherwise notify potential claimants of the procedures by which claims may be presented to the Fund.

[*1015]
SEC. 1015. <*33 USC 2715*> SUBROGATION.

(a) IN GENERAL.—Any person, including the Fund, who pays compensation pursuant to this Act to any claimant for removal costs or damages shall be subrogated to all rights, claims, and causes of action that the claimant has under any other law.

(b) ACTIONS ON BEHALF OF FUND.—At the request of the Secretary, the Attorney General shall commence an action on behalf of the Fund to recover any compensation paid by the Fund to any claimant pursuant to this Act, and all costs incurred by the Fund by reason of the claim, including interest (including prejudgment interest), administrative and adjudicative costs, and attorney's fees. Such an action may be commenced against any responsible party or (subject to section 1016) guarantor, or against any other person who is liable, pursuant to any law, to the compensated claimant or to the Fund, for the cost or damages for which the compensation was paid. Such an action shall be commenced against the responsible foreign government or other responsible party to recover any removal costs or damages paid from the Fund as the result of the discharge, or substantial threat of discharge, of oil from a foreign offshore unit.

[*1016]
SEC. 1016. <*33 USC 2716*> FINANCIAL RESPONSIBILITY.

(a) REQUIREMENT.—The responsible party for

(1) any vessel over 300 gross tons (except a non-self-propelled vessel that does not carry oil as cargo or fuel) using any place subject to the jurisdiction of the United States; or

(2) any vessel using the waters of the exclusive economic zone to transship or lighter oil destined for a place subject to the jurisdiction of the United States; shall establish and maintain, in accordance with regulations promulgated by the Secretary, evidence of financial responsibility sufficient to meet the maximum amount of liability to which, in the case of a tank vessel, the responsible party could be subject under section 1004 (a)(1) or (d) of this Act, or to which, in the case of any other vessel, the responsible party could be subjected under section 1004 (a)(2) or (d), in a case where the responsible party would be entitled to limit liability under that section. If the responsible party owns or operates more than one vessel, evidence of financial responsibility need be established only to meet the amount of the maximum liability applicable to the vessel having the greatest maximum liability.

(b) SANCTIONS.

[**503] (1) WITHHOLDING CLEARANCE.—The Secretary of the Treasury shall withhold or revoke the clearance required by section 4197 of the Revised Statutes of the United States of any vessel subject to this section that does not have the evidence of financial responsibility required for the vessel under this section.

(2) DENYING ENTRY TO OR DETAINING VESSELS.—The Secretary may

(A) deny entry to any vessel to any place in the United States, or to the navigable waters, or

(B) detain at the place, any vessel that, upon request, does not produce the evidence of financial responsibility required for the vessel under this section.

(3) SEIZURE OF VESSEL.—Any vessel subject to the requirements of this section which is found in the navigable waters without the necessary evidence of financial responsibility for the vessel shall be subject to seizure by and forfeiture to the United States.

(c) OFFSHORE FACILITIES.

(1) IN GENERAL.—Except as provided in paragraph (2), each responsible party with respect to an offshore facility shall establish and maintain evidence of financial responsibility of $150,000,000 to meet the amount of liability to which the responsible party could be subjected under section 1004(a) in a case in which the responsible party would be entitled to limit liability under that section. In a case in which a person is the responsible party for more than one facility subject to this subsection, evidence

of financial responsibility need be established only to meet the maximum liability applicable to the facility having the greatest maximum liability.

(2) DEEPWATER PORTS.—Each responsible party with respect to a deepwater port shall establish and maintain evidence of financial responsibility sufficient to meet the maximum amount of liability to which the responsible party could be subjected under section 1004(a) of this Act in a case where the responsible party would be entitled to limit liability under that section. If the Secretary exercises the authority under section 1004(d)(2) to lower the limit of liability for deepwater ports, the responsible party shall establish and maintain evidence of financial responsibility sufficient to meet the maximum amount of liability so established. In a case in which a person is the responsible party for more than one deepwater port, evidence of financial responsibility need be established only to meet the maximum liability applicable to the deepwater port having the greatest maximum liability.

(e) METHODS OF FINANCIAL RESPONSIBILITY.—Financial responsibility under this section may be established by any one, or by any combination, of the following methods which the Secretary (in the case of a vessel) or the President (in the case of a facility) determines to be acceptable: evidence of insurance, surety bond, guarantee, letter of credit, qualification as a self-insurer, or other evidence of financial responsibility. Any bond filed shall be issued by a bonding company authorized to do business in the United States. In promulgating requirements under this section, the Secretary or the President, as appropriate, may specify policy or other contractual terms, conditions, or defenses which are necessary, or which are unacceptable, [**504] in establishing evidence of financial responsibility to effectuate the purposes of this Act.

(f) CLAIMS AGAINST GUARANTOR.—Any claim for which liability may be established under section 1002 may be asserted directly against any guarantor providing evidence of financial responsibility for a responsible party liable under that section for removal costs and damages to which the claim pertains. In defending against such a claim, the guarantor may invoke (1) all rights and defenses which would be available to the responsible party under this Act, (2) any defense authorized under subsection (e), and (3) the defense that the incident was caused by the willful misconduct of the responsible party. The guarantor may not invoke any other defense that might be available in proceedings brought by the responsible party against the guarantor.

(g) LIMITATION ON GUARANTOR'S LIABILITY.—Nothing in this Act shall impose liability with respect to an incident on any guarantor for damages or removal costs which exceed, in the aggregate, the amount of financial responsibility required under this Act which that guarantor has provided for a responsible party.

(h) CONTINUATION OF REGULATIONS.—Any regulation relating to financial

responsibility, which has been issued pursuant to any provision of law repealed or superseded by this Act, and which is in effect on the date immediately preceding the effective date of this Act, is deemed and shall be construed to be a regulation issued pursuant to this section. Such a regulation shall remain in full force and effect unless and until superseded by a new regulation issued under this section.

(i) UNIFIED CERTIFICATE.—The Secretary may issue a single unified certificate of financial responsibility for purposes of this Act and any other law.

[*1017]
SEC. 1017. <*33 USC 2717*> LITIGATION, JURISDICTION, AND VENUE.

(a) REVIEW OF REGULATIONS.—Review of any regulation promulgated under this Act may be had upon application by any interested person only in the Circuit Court of Appeals of the United States for the District of Columbia. Any such application shall be made within 90 days from the date of promulgation of such regulations. Any matter with respect to which review could have been obtained under this subsection shall not be subject to judicial review in any civil or criminal proceeding for enforcement or to obtain damages or recovery of response costs.

(b) JURISDICTION.—Except as provided in subsections (a) and (c), the United States district courts shall have exclusive original jurisdiction over all controversies arising under this Act, without regard to the citizenship of the parties or the amount in controversy. Venue shall lie in any district in which the discharge or injury or damages occurred, or in which the defendant resides, may be found, has its principal office, or has appointed an agent for service of process. For the purposes of this section, the Fund shall reside in the District of Columbia.

(c) STATE COURT JURISDICTION.—A State trial court of competent jurisdiction over claims for removal costs or damages, as defined under this Act, may consider claims under this Act or State law and any final judgment of such court (when no longer subject to ordinary forms of review) shall be recognized, valid, and enforceable for all purposes of this Act.

[**505] (d) ASSESSMENT AND COLLECTION OF TAX.—The provisions of subsections (a), (b), and (c) shall not apply to any controversy or other matter resulting from the assessment or collection of any tax, or to the review of any regulation promulgated under the Internal Revenue Code of 1986.

(e) SAVINGS PROVISION.—Nothing in this title shall apply to any cause of action or right of recovery arising from any incident which occurred prior to the date of enactment of this title. Such claims shall be adjudicated pursuant to the law applicable

on the date of the incident.

(f) PERIOD OF LIMITATIONS.

(1) DAMAGES.—Except as provided in paragraphs (3) and (4), an action for damages under this Act shall be barred unless the action is brought within 3 years after

(A) the date on which the loss and the connection of the loss with the discharge in question are reasonably discoverable with the exercise of due care, or

(B) in the case of natural resource damages under section 1002(b)(2)(A), the date of completion of the natural resources damage assessment under section 1006(c).

(2) REMOVAL COSTS.—An action for recovery of removal costs referred to in section 1002(b)(1) must be commenced within 3 years after completion of the removal action. In any such action described in this subsection, the court shall enter a declaratory judgment on liability for removal costs or damages that will be binding on any subsequent action or actions to recover further removal costs or damages. Except as otherwise provided in this paragraph, an action may be commenced under this title for recovery of removal costs at any time after such costs have been incurred.

(3) CONTRIBUTION.—No action for contribution for any removal costs or damages may be commenced more than 3 years after

(A) the date of judgment in any action under this Act for recovery of such costs or damages, or

(B) the date of entry of a judicially approved settlement with respect to such costs or damages.

(4) SUBROGATION.—No action based on rights subrogated pursuant to this Act by reason of payment of a claim may be commenced under this Act more than 3 years after the date of payment of such claim.

(5) COMMENCEMENT.—The time limitations contained herein shall not begin to run

(A) against a minor until the earlier of the date when such minor reaches 18 years of age or the date on which a legal representative is duly appointed for such minor, or

(B) against an incompetent person until the earlier of the date on which such incompetent's incompetency ends or the date on which a legal representative is duly appointed for such incompetent.

[*1018]

SEC. 1018. <*33 USC 2718*> RELATIONSHIP TO OTHER LAW.

(a) PRESERVATION OF STATE AUTHORITIES; SOLID WASTE DISPOSAL ACT.—Nothing in this Act or the Act of March 3, 1851 shall

(1) affect, or be construed or interpreted as preempting, the authority of any State or political subdivision thereof from [**506] imposing any additional liability or requirements with respect to

(A) the discharge of oil or other pollution by oil within such State; or

(B) any removal activities in connection with such a discharge; or

(2) affect, or be construed or interpreted to affect or modify in any way the obligations or liabilities of any person under the Solid Waste Disposal Act (*42 USC 6901* et seq.) or State law, including common law.

(b) PRESERVATION OF STATE FUNDS.—Nothing in this Act or in section 9509 of the Internal Revenue Code of 1986 (*26 USC 9509*) shall in any way affect, or be construed to affect, the authority of any State –

(1) to establish, or to continue in effect, a fund any purpose of which is to pay for costs or damages arising out of, or directly resulting from, oil pollution or the substantial threat of oil pollution; or

(2) to require any person to contribute to such a fund.

(c) ADDITIONAL REQUIREMENTS AND LIABILITIES; PENALTIES.—Nothing in this Act, the Act of March 3, 1851 (*46 USC 183* et seq.), or section 9509 of the Internal Revenue Code of 1986 (*26 USC 9509*), shall in any way affect, or be construed to affect, the authority of the United States or any State or political subdivision thereof –

(1) to impose additional liability or additional requirements; or

(2) to impose, or to determine the amount of, any fine or penalty (whether criminal or civil in nature) for any violation of law; relating to the discharge, or substantial threat of a discharge, of oil.

(d) FEDERAL EMPLOYEE LIABILITY.—For purposes of section 2679(b)(2)(B) of title 28, United States Code, nothing in this Act shall be construed to authorize or create a cause of action against a Federal officer or employee in the officer's or employee's personal or individual capacity for any act or omission while acting within the scope of the officer's or employee's office or employment.

[*1019]
SEC. 1019. <*33 USC 2719*> STATE FINANCIAL RESPONSIBILITY.

A State may enforce, on the navigable waters of the State, the requirements for evidence of financial responsibility under section 1016.

[*1020]
SEC. 1020. <*33 USC 2701* note> APPLICATION.

This Act shall apply to an incident occurring after the date of the enactment of this Act.

TITLE II—CONFORMING AMENDMENTS

[*2001]
SEC. 2001. INTERVENTION ON THE HIGH SEAS ACT.

Section 17 of the Intervention on the High Seas Act (33 .S.C. 1486) is amended to read as follows:

"Sec. 17. The Oil Spill Liability Trust Fund shall be available to the Secretary for actions taken under sections 5 and 7 of this Act."

[**507] [*2002]
SEC. 2002. <*33 USC 1321* note> FEDERAL WATER POLLUTION CONTROL ACT.

(a) APPLICATION.—Subsections (f), (g), (h), and (i) of section 311 of the Federal Water Pollution Control Act (*33 USC 1321*) shall not apply with respect to any incident for which liability is established under section 1002 of this Act.

(b) CONFORMING AMENDMENTS.—Section 311 of the Federal Water Pollution Control Act (*33 USC 1321*) is amended as follows:

(1) Subsection (i) is amended by striking "(1)" after "(i)" and by striking paragraphs (2) and (3).

(2) <*33 USC 1321* note> Subsection (k) is repealed. Any amounts remaining in the revolving fund established under that subsection shall be deposited in the Fund. The Fund shall assume all liability incurred by the revolving fund established under that subsection.

(3) Subsection (l) is amended by striking the second sentence.

(4) Subsection (p) is repealed.

(5) The following is added at the end thereof:

"(s) The Oil Spill Liability Trust Fund established under section 9509 of the Internal Revenue Code of 1986 (*26 USC 9509*) shall be available to carry out subsections (b), (c), (d), (j), and (l) as those subsections apply to discharges, and substantial threats of discharges, of oil. Any amounts received by the United States under this section shall be deposited in the Oil Spill Liability Trust Fund."

[*2003]
SEC. 2003. DEEPWATER PORT ACT.

(a) CONFORMING AMENDMENTS.—The Deepwater Port Act of 1974 (*33 USC 1502* et seq.) is amended

(1) in section 4(c)(1) <*33 USC 1503*> by striking "section 18(l) of this Act;" and inserting "section 1016 of the Oil Pollution Act of 1990"; and

(2) *<33 USC 1517>* by striking section 18.

(b) *<26 USC 9509* note> AMOUNTS REMAINING IN DEEPWATER PORT FUND.—Any amounts remaining in the Deepwater Port Liability Fund established under section 18(f) of the Deepwater Port Act of 1974 (*33 USC 1517*(f)) shall be deposited in the Oil Spill Liability Trust Fund established under section 9509 of the Internal Revenue Code of 1986 (*26 USC 9509*). The Oil Spill Liability Trust Fund shall assume all liability incurred by the Deepwater Port Liability Fund.

[*2004]
SEC. 2004. OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS OF 1978.

Title III of the Outer Continental Shelf Lands Act Amendments of 1978 (*43 USC 1811–1824*) *<26 USC 9509* note> is repealed. Any amounts remaining in the Offshore Oil Pollution Compensation Fund established under section 302 of that title (*43 USC 1812*) shall be deposited in the Oil Spill Liability Trust Fund established under section 9509 of the Internal Revenue Code of 1986 (*26 USC 9509*). The Oil Spill Liability Trust Fund shall assume all liability incurred by the Offshore Oil Pollution Compensation Fund.

TITLE III—INTERNATIONAL OIL POLLUTION PREVENTION AND REMOVAL

[*3001]
SEC. 3001. SENSE OF CONGRESS REGARDING PARTICIPATION IN INTERNATIONAL REGIME.

It is the sense of the Congress that it is in the best interests of the United States to participate in an international oil pollution liability [**508] and compensation regime that is at least as effective as Federal and State laws in preventing incidents and in guaranteeing full and prompt compensation for damages resulting from incidents.

[*3002]
SEC. 3002. UNITED STATES–CANADA GREAT LAKES OIL SPILL COOPERATION.

(a) REVIEW.—The Secretary of State shall review relevant international agreements and treaties with the Government of Canada, including the Great Lakes Water Quality Agreement, to determine whether amendments or additional international agreements are necessary to

(1) prevent discharges of oil on the Great Lakes;

(2) ensure an immediate and effective removal of oil on the Great Lakes; and

(3) fully compensate those who are injured by a discharge of oil on the Great Lakes.

(b) CONSULTATION.—In carrying out this section, the Secretary of State shall consult with the Department of Transportation, the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, the Great Lakes States, the International Joint Commission, and other appropriate agencies.

(c) REPORT.—The Secretary of State shall submit a report to the Congress on the results of the review under this section within 6 months after the date of the enactment of this Act.

[*3003]
SEC. 3003. UNITED STATES-CANADA LAKE CHAMPLAIN OIL SPILL CO. OPERATION.

(a) REVIEW.—The Secretary of State shall review relevant international agreements and treaties with the Government of Canada, to determine whether amendments or additional international agreements are necessary to

(1) prevent discharges of oil on Lake Champlain;
(2) ensure an immediate and effective removal of oil on Lake Champlain; and
(3) fully compensate those who are injured by a discharge of oil on Lake Champlain.

(b) CONSULTATION.—In carrying out this section, the Secretary of State shall consult with the Department of Transportation, the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, the States of Vermont and New York, the International Joint Commission, and other appropriate agencies.

(c) REPORT.—The Secretary of State shall submit a report to the Congress on the results of the review under this section within 6 months after the date of the enactment of this Act.

[*3004]
SEC. 3004. INTERNATIONAL INVENTORY OF REMOVAL EQUIPMENT AND PERSONNEL.

The President shall encourage appropriate international organizations to establish an international inventory of spill removal equipment and personnel.

[*3005]
SEC. 3005. NEGOTIATIONS WITH CANADA CONCERNING TUG ESCORTS IN PUGET SOUND.

Congress urges the Secretary of State to enter into negotiations with the Government of Canada to ensure that tugboat escorts are required for all tank vessels with a capacity over 40,000 deadweight tons in the Strait of Juan de Fuca and in Haro Strait.

[**509] TITLE IV—PREVENTION AND REMOVAL

SUBTITLE A—PREVENTION

[*4115]
SEC. 4115. ESTABLISHMENT OF DOUBLE HULL REQUIREMENT FOR TANK VESSELS.

(a) DOUBLE HULL REQUIREMENT.—Chapter 37 of title 46, United States Code, is amended by inserting after section 3703 the following new section:
"§ 3703a. Tank vessel construction standards

"(a) Except as otherwise provided in this section, a vessel to which this chapter applies shall be equipped with a double hull
"(1) if it is constructed or adapted to carry, or carries, oil in bulk as cargo or cargo residue; and
[**518] "(2) when operating on the waters subject to the jurisdiction of the United States, including the Exclusive Economic Zone.

"(b) This section does not apply to
"(1) a vessel used only to respond to a discharge of oil or a hazardous substance;
"(2) a vessel of less than 5,000 gross tons equipped with a double containment system determined by the Secretary to be as effective as a double hull for the prevention of a discharge of oil; or
"(3) before January 1, 2015
"(A) a vessel unloading oil in bulk at a deepwater port licensed under the Deepwater Port Act of 1974 (*33 USC 1501* et seq.); or
"(B) a delivering vessel that is offloading in lightering activities
"(i) within a lightering zone established under section 3715(b) (5) of this title; and
"(ii) more than 60 miles from the baseline from which the territorial sea of the United States is measured.

"(c)(1) In this subsection, the age of a vessel is determined from the later of the date on which the vessel
"(A) is delivered after original construction;
"(B) is delivered after completion of a major conversion; or

"(C) had its appraised salvage value determined by the Coast Guard and is qualified for documentation under section 4136 of the Revised Statutes of the United States (*46 App. USC 14*).

"(2) A vessel of less than 5,000 gross tons for which a building contract or contract for major conversion was placed before June 30, 1990, and that is delivered under that contract before January 1, 1994, and a vessel of less than 5,000 gross tons that had its appraised salvage value determined by the Coast Guard before June 30, 1990, and that qualifies for documentation under section 4136 of the Revised Statutes of the United States (*46 App. USC 14*) before January 1, 1994, may not operate in the navigable waters or the Exclusive Economic Zone of the United States after January 1, 2015, unless the vessel is equipped with a double hull or with a double containment system determined by the Secretary to be as effective as a double hull for the prevention of a discharge of oil.

"(3) A vessel for which a building contract or contract for major conversion was placed before June 30, 1990, and that is delivered under that contract before January 1, 1994, and a vessel that had its appraised salvage value determined by the Coast Guard before June 30, 1990, and that qualifies for documentation under section 4136 of the Revised Statutes of the United States (*46 App. USC 14*) before January 1, 1994, may not operate in the navigable waters or Exclusive Economic Zone of the United States unless equipped with a double hull

"(A) in the case of a vessel of at least 5,000 gross tons but less than 15,000 gross tons

"(i) after January 1, 1995, if the vessel is 40 years old or older and has a single hull, or is 45 years old or older and has a double bottom or double sides;

"(ii) after January 1, 1996, if the vessel is 39 years old or older and has a single hull, or is 44 years old or older and has a double bottom or double sides;

[**519] "(iii) after January 1, 1997, if the vessel is 38 years old or older and has a single hull, or is 43 years old or older and has a double bottom or double sides;

"(iv) after January 1, 1998, if the vessel is 37 years old or older and has a single hull, or is 42 years old or older and has a double bottom or double sides;

"(v) after January 1, 1999, if the vessel is 36 years old or older and has a single hull, or is 41 years old or older and has a double bottom or double sides;

"(vi) after January 1, 2000, if the vessel is 35 years old or older and has a single hull, or is 40 years old or older and has a double bottom or double sides; and

"(vii) after January 1, 2005, if the vessel is 25 years old or older and has a single hull, or is 30 years old or older and has a double bottom or double sides;

"(B) in the case of a vessel of at least 15,000 gross tons but less than 30,000 gross tons

"(i) after January 1, 1995, if the vessel is 40 years old or older and has a single hull, or is 45 years old or older and has a double bottom or double sides;

"(ii) after January 1, 1996, if the vessel is 38 years old or older and has a single hull, or is 43 years old or older and has a double bottom or double sides;

"(iii) after January 1, 1997, if the vessel is 36 years old or older and has a single hull, or is 41 years old or older and has a double bottom or double sides;

"(iv) after January 1, 1998, if the vessel is 34 years old or older and has a single hull, or is 39 years old or older and has a double bottom or double sides;

"(v) after January 1, 1999, if the vessel is 32 years old or older and has a single hull, or 37 years old or older and has a double bottom or double sides;

"(vi) after January 1, 2000, if the vessel is 30 years old or older and has a single hull, or is 35 years old or older and has a double bottom or double sides;

"(vii) after January 1, 2001, if the vessel is 29 years old or older and has a single hull, or is 34 years old or older and has a double bottom or double sides;

"(viii) after January 1, 2002, if the vessel is 28 years old or older and has a single hull, or is 33 years old or older and has a double bottom or double sides;

"(ix) after January 1, 2003, if the vessel is 27 years old or older and has a single hull, or is 32 years old or older and has a double bottom or double sides;

"(x) after January 1, 2004, if the vessel is 26 years old or older and has a single hull, or is 31 years old or older and has a double bottom or double sides; and

"(xi) after January 1, 2005, if the vessel is 25 years old or older and has a single hull, or is 30 years old or older and has a double bottom or double sides; and

"(C) in the case of a vessel of at least 30,000 gross tons

"(i) after January 1, 1995, if the vessel is 28 years old or older and has a single hull, or 33 years old or older and has a double bottom or double sides;

"(ii) after January 1, 1996, if the vessel is 27 years old or older and has a single hull, or is 32 years old or older and has a double bottom or double sides;

[**520] "(iii) after January 1, 1997, if the vessel is 26 years old or older and has a single hull, or is 31 years old or older and has a double bottom or double sides;

"(iv) after January 1, 1998, if the vessel is 25 years old or older and has a single hull, or is 30 years old or older and has a double bottom or double sides;

"(v) after January 1, 1999, if the vessel is 24 years old or older and has a single hull, or 29 years old or older and has a double bottom or double sides; and

"(vi) after January 1, 2000, if the vessel is 23 years old or older and has a single hull, or is 28 years old or older and has a double bottom or double sides.

"(4) Except as provided in subsection (b) of this section

"(A) a vessel that has a single hull may not operate after January 1, 2010; and

"(B) a vessel that has a double bottom or double sides may not operate after January 1, 2015."

(b) <*46 USC 3703a* note> RULEMAKING.—The Secretary shall, within 12 months after the date of the enactment of this Act, complete a rulemaking proceeding and issue a final rule to require that tank vessels over 5,000 gross tons affected by section 3703a of title 46, United States Code, as added by this section, comply until January 1, 2015, with structural and operational requirements that the Secretary determines will provide as substantial protection to the environment as is economically and tech-

nologically feasible.

(c) CLERICAL AMENDMENT.—The analysis for chapter 37 of title 46, United States Code, is amended by inserting after the item relating to section 3703 the following:

"3703a. Tank vessel construction standards."

(d) LIGHTERING REQUIREMENTS.—Section 3715(a) of title 46, United States Code, is amended

(1) in paragraph (1), by striking "; and" and inserting a semicolon;

(2) in paragraph (2), by striking the period and inserting ";and"; and

(3) by adding at the end the following:

"(3) the delivering and the receiving vessel had on board at the time of transfer, a certificate of financial responsibility as would have been required under section 1016 of the Oil Pollution Act of 1990, had the transfer taken place in a place subject to the jurisdiction of the United States;

"(4) the delivering and the receiving vessel had on board at the time of transfer, evidence that each vessel is operating in compliance with section 311(j) of the Federal Water Pollution Control Act (*33 USC 1321*(j)); and

"(5) the delivering and the receiving vessel are operating in compliance with section 3703a of this title."

(e) <*46 USC 3703a* note> SECRETARIAL STUDIES.

(1) OTHER REQUIREMENTS.—Not later than 6 months after the date of enactment of this Act, the Secretary shall determine, based on recommendations from the National Academy of Sciences or other qualified organizations, whether other structural and operational tank vessel requirements will provide protection to the marine environment equal to or greater than that provided by double hulls, and shall report to the Congress that determination and recommendations for legislative action.

[**521] (2) REVIEW AND ASSESSMENT.—The Secretary shall

(A) periodically review recommendations from the National Academy of Sciences and other qualified organizations on methods for further increasing the environmental and operational safety of tank vessels;

(B) not later than 5 years after the date of enactment of this Act, assess the impact of this section on the safety of the marine environment and the economic viability and operational makeup of the maritime oil transportation industry; and

(C) report the results of the review and assessment to the Congress with recommendations for legislative or other action.

(f) VESSEL FINANCING.—Section 1104 of the Merchant Marine Act of 1936 (*46 App. USC 1274*) is amended

(1) by striking "SEC. 1104." and inserting "Sec. 1104A."; and

(2) by inserting after section 1104A (as redesignated by paragraph (1)) the following:

"SEC. 1104B. *<46 USC app. 1274a>* (a) Notwithstanding the provisions of this title, except as provided in subsection (d) of this section, the Secretary, upon the terms the Secretary may prescribe, may guarantee or make a commitment to guarantee, payment of the principal of and interest on an obligation which aids in financing and refinancing, including reimbursement to an obligor for expenditures previously made, of a contract for construction or reconstruction of a vessel or vessels owned by citizens of the United States which are designed and to be employed for commercial use in the coastwise or intercoastal trade or in foreign trade as defined in section 905 of this Act if

"(1) the construction or reconstruction by an applicant is made necessary to replace vessels the continued operation of which is denied by virtue of the imposition of a statutorily mandated change in standards for the operation of vessels, and where, as a matter of law, the applicant would otherwise be denied the right to continue operating vessels in the trades in which the applicant operated prior to the taking effect of the statutory or regulatory change;

"(2) the applicant is presently engaged in transporting cargoes in vessels of the type and class that will be constructed or reconstructed under this section, and agrees to employ vessels constructed or reconstructed under this section as replacements only for vessels made obsolete by changes in operating standards imposed by statute;

"(3) the capacity of the vessels to be constructed or reconstructed under this title will not increase the cargo carrying capacity of the vessels being replaced;

"(4) the Secretary has not made a determination that the market demand for the vessel over its useful life will diminish so as to make the granting of the guarantee fiduciarily imprudent; and

"(5) the Secretary has considered the provisions of section 1104A(d)(1)(A) (iii), (iv), and (v) of this title.

"(b) For the purposes of this section

"(1) the maximum term for obligations guaranteed under this program may not exceed 25 years;

[**522] "(2) obligations guaranteed may not exceed 75 percent of the actual cost or depreciated actual cost to the applicant for the construction or reconstruction of the vessel; and

"(3) reconstruction cost obligations may not be guaranteed unless the vessel after reconstruction will have a useful life of at least 15 years.

"(c)(1) The Secretary shall by rule require that the applicant provide adequate security against default. The Secretary may, in addition to any fees assessed under section 1104A(e), establish a Vessel Replacement Guarantee Fund into which shall be paid by obligors under this section

"(A) annual fees which may be an additional amount on the loan guarantee fee in section 1104A(e) not to exceed an additional 1 percent; or

"(B) fees based on the amount of the obligation versus the percentage of the obligor's fleet being replaced by vessels constructed or reconstructed under this section.

"(2) The Vessel Replacement Guarantee Fund shall be a subaccount in the Federal Ship Financing Fund, and shall

"(A) be the depository for all moneys received by the Secretary under sections 1101 through 1107 of this title with respect to guarantee or commitments to guarantee made under this section;

"(B) not include investigation fees payable under section 1104A(f) which shall be paid to the Federal Ship Financing Fund; and

"(C) be the depository, whenever there shall be outstanding any notes or obligations issued by the Secretary under section 1105(d) with respect to the Vessel Replacement Guarantee Fund, for all moneys received by the Secretary under sections 1101 through 1107 from applicants under this section.

"(d) The program created by this section shall, in addition to the requirements of this section, be subject to the provisions of sections 1101 through 1103; 1104A(b)(1), (4), (5), (6); 1104A(e); 1104A(f); 1104A(h); and 1105 through 1107; except that the Federal Ship Financing Fund is not liable for any guarantees or commitments to guarantee issued under this section."

[*4116]
SEC. 4116. PILOTAGE.

(a) PILOT REQUIRED.—Section 8502(g) of title 46, United States Code, is amended to read as follows:

"(g)(1) The Secretary shall designate by regulation the areas of the approaches to and waters of Prince William Sound, Alaska, if any, on which a vessel subject to this section is not required to be under the direction and control of a pilot licensed under section 7101 of this title.

"(2) In any area of Prince William Sound, Alaska, where a vessel subject to this section is required to be under the direction and control of a pilot licensed under section 7101 of this title, the pilot may not be a member of the crew of that vessel and shall be a pilot licensed by the State of Alaska who is operating under a Federal license, when the vessel is navigating waters between 60 degrees 49!cf60+25 North latitude and the Port of Valdez, Alaska."

(b) SECOND PERSON REQUIRED.—Section 8502 of title 46, United States Code, is amended by adding at the end the following:

"(h) The Secretary shall designate waters on which tankers over 1,600 gross tons subject to this section shall have on the bridge a [**523] master or mate licensed to

direct and control the vessel under section 7101(c)(1) of this title who is separate and distinct from the pilot required under subsection (a) of this section."

(c) <*46 USC 3703* note> ESCORTS FOR CERTAIN TANKERS.—Not later than 6 months after the date of the enactment of this Act, the Secretary shall initiate issuance of regulations under section 3703(a)(3) of title 46, United States Code, to define those areas, including Prince William Sound, Alaska, and Rosario Strait and Puget Sound, Washington (including those portions of the Strait of Juan de Fuca east of Port Angeles, Haro Strait, and the Strait of Georgia subject to United States jurisdiction), on which single hulled tankers over 5,000 gross tons transporting oil in bulk shall be escorted by at least two towing vessels (as defined under section 2101 of title 46, United States Code) or other vessels considered appropriate by the Secretary.

(d) <*46 USC 3703* note> TANKER DEFINED.—In this section the term "tanker" has the same meaning the term has in section 2101 of title 46, United States Code.

[*4117]
SEC. 4117. <*46 USC app. 1295* note> MARITIME POLLUTION PREVENTION TRAINING PROGRAM STUDY.

The Secretary shall conduct a study to determine the feasibility of a Maritime Oil Pollution Prevention Training program to be carried out in cooperation with approved maritime training institutions. The study shall assess the costs and benefits of transferring suitable vessels to selected maritime training institutions, equipping the vessels for oil spill response, and training students in oil pollution response skills. The study shall be completed and transmitted to the Congress no later than one year after the date of the enactment of this Act.

[*4118]
SEC. 4118. <*33 USC 1203* note> VESSEL COMMUNICATION EQUIPMENT REGULATIONS.

The Secretary shall, not later than one year after the date of the enactment of this Act, issue regulations necessary to ensure that vessels subject to the Vessel Bridge-to-Bridge Radiotelephone Act of 1971 (*33 USC 1203*) are also equipped as necessary to

(1) receive radio marine navigation safety warnings; and

(2) engage in radio communications on designated frequencies with the Coast Guard, and such other vessels and stations as may be specified by the Secretary.

SUBTITLE B—REMOVAL

[*4201]
SEC. 4201. FEDERAL REMOVAL AUTHORITY.

(a) IN GENERAL.—Subsection (c) of section 311 of the Federal Water Pollution Control Act (*33 USC 1321*(c)) is amended to read as follows:

"(c) FEDERAL REMOVAL AUTHORITY.

"(1) GENERAL REMOVAL REQUIREMENT.—(A) The President shall, in accordance with the National Contingency Plan and any appropriate Area Contingency Plan, ensure effective and immediate removal of a discharge, and mitigation or prevention of a substantial threat of a discharge, of oil or a hazardous substance

"(i) into or on the navigable waters;

"(ii) on the adjoining shorelines to the navigable waters;

[**524] "(iii) into or on the waters of the exclusive economic zone; or

"(iv) that may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States.

"(B) In carrying out this paragraph, the President may

"(i) remove or arrange for the removal of a discharge, and mitigate or prevent a substantial threat of a discharge, at any time;

"(ii) direct or monitor all Federal, State, and private actions to remove a discharge; and

"(iii) remove and, if necessary, destroy a vessel discharging, or threatening to discharge, by whatever means are available.

"(2) DISCHARGE POSING SUBSTANTIAL THREAT TO PUBLIC HEALTH OR WELFARE.—(A) If a discharge, or a substantial threat of a discharge, of oil or a hazardous substance from a vessel, offshore facility, or onshore facility is of such a size or character as to be a substantial threat to the public health or welfare of the United States (including but not limited to fish, shellfish, wildlife, other natural resources, and the public and private beaches and shorelines of the United States), the President shall direct all Federal, State, and private actions to remove the discharge or to mitigate or prevent the threat of the discharge.

"(B) In carrying out this paragraph, the President may, without regard to any other provision of law governing contracting procedures or employment of personnel by the Federal Government

"(i) remove or arrange for the removal of the discharge, or mitigate or prevent the substantial threat of the discharge; and

"(ii) remove and, if necessary, destroy a vessel discharging, or threatening to discharge, by whatever means are available.

"(3) ACTIONS IN ACCORDANCE WITH NATIONAL CONTINGENCY PLAN.—(A) Each Federal agency, State, owner or operator, or other person participating in efforts under this subsection shall act in accordance with the National Contingency Plan or as directed by the President.

"(B) An owner or operator participating in efforts under this subsection shall act in accordance with the National Contingency Plan and the applicable response plan required under subsection (j), or as directed by the President.

"(4) EXEMPTION FROM LIABILITY.—(A) A person is not liable for removal costs or damages which result from actions taken or omitted to be taken in the course of rendering care, assistance, or advice consistent with the National Contingency Plan or as otherwise directed by the President.

"(B) Subparagraph (A) does not apply

"(i) to a responsible party;

"(ii) to a response under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (*42 USC 9601* et seq.);

"(iii) with respect to personal injury or wrongful death; or

"(iv) if the person is grossly negligent or engages in willful misconduct.

[**525] "(C) A responsible party is liable for any removal costs and damages that another person is relieved of under subparagraph (A).

"(5) OBLIGATION AND LIABILITY OF OWNER OR OPERATOR NOT AFFECTED.—Nothing in this subsection affects

"(A) the obligation of an owner or operator to respond immediately to a discharge, or the threat of a discharge, of oil; or

"(B) the liability of a responsible party under the Oil Pollution Act of 1990.

"(6) RESPONSIBLE PARTY DEFINED.—For purposes of this subsection, the term 'responsible party' has the meaning given that term under section 1001 of the Oil Pollution Act of 1990."

(b) NATIONAL CONTINGENCY PLAN.—Subsection (d) of section 311 of the Federal Water Pollution Control Act (*33 USC 1321*(d)) is amended to read as follows:

"(d) NATIONAL CONTINGENCY PLAN.

"(1) PREPARATION BY PRESIDENT.—The President shall prepare and publish a National Contingency Plan for removal of oil and hazardous substances pursuant to this section.

"(2) CONTENTS.—The National Contingency Plan shall provide for efficient, coordinated, and effective action to minimize damage from oil and hazardous substance discharges, including containment, dispersal, and removal of oil and hazardous substances, and shall include, but not be limited to, the following:

"(A) Assignment of duties and responsibilities among Federal departments and agencies in coordination with State and local agencies and port authorities including, but not limited to, water pollution control and conservation and trusteeship of natural resources (including conservation of fish and wildlife).

"(B) Identification, procurement, maintenance, and storage of equipment and supplies.

"(C) Establishment or designation of Coast Guard strike teams, consisting of

"(i) personnel who shall be trained, prepared, and available to provide necessary services to carry out the National Contingency Plan;

"(ii) adequate oil and hazardous substance pollution control equipment and material; and

"(iii) a detailed oil and hazardous substance pollution and prevention plan, including measures to protect fisheries and wildlife.

"(D) A system of surveillance and notice designed to safeguard against as well as ensure earliest possible notice of discharges of oil and hazardous substances and imminent threats of such discharges to the appropriate State and Federal agencies.

"(E) Establishment of a national center to provide coordination and direction for operations in carrying out the Plan.

"(F) Procedures and techniques to be employed in identifying, containing, dispersing, and removing oil and hazardous substances.

"(G) A schedule, prepared in cooperation with the States, identifying

[**526] "(i) dispersants, other chemicals, and other spill mitigating devices and substances, if any, that may be used in carrying out the Plan,

"(ii) the waters in which such dispersants, other chemicals, and other spill mitigating devices and substances may be used, and

"(iii) the quantities of such dispersant, other chemicals, or other spill mitigating device or substance which can be used safely in such waters, which schedule shall provide in the case of any dispersant, chemical, spill mitigating device or substance, or waters not specifically identified in such schedule that the President, or his delegate, may, on a case-by-case basis, identify the dispersants, other chemicals, and other spill mitigating devices and substances which may be used, the waters in which they may be used, and the quantities which can be used safely in such waters.

"(H) A system whereby the State or States affected by a discharge of oil or hazardous substance may act where necessary to remove such discharge and such State or States may be reimbursed in accordance with the Oil Pollution Act of 1990, in the case of any discharge of oil from a vessel or facility, for the reasonable costs incurred for that removal, from the Oil Spill Liability Trust Fund.

"(I) Establishment of criteria and procedures to ensure immediate and effective Federal identification of, and response to, a discharge, or the threat of a discharge, that results in a substantial threat to the public health or welfare of the United States, as required under subsection (c)(2).

"(J) Establishment of procedures and standards for removing a worst case discharge of oil, and for mitigating or preventing a substantial threat of such a discharge.

"(K) Designation of the Federal official who shall be the Federal On-Scene Coordinator for each area for which an Area Contingency Plan is required to be prepared under subsection (j).

"(L) Establishment of procedures for the coordination of activities of

"(i) Coast Guard strike teams established under subparagraph (C);

"(ii) Federal On-Scene Coordinators designated under subparagraph (K);

"(iii) District Response Groups established under subsection (j); and

"(iv) Area Committees established under subsection (j).

"(M) A fish and wildlife response plan, developed in consultation with the United States Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, and other interested parties (including State fish and wildlife conservation officials), for the immediate and effective protection, rescue, and rehabilitation of, and the minimization of risk of damage to, fish and wildlife resources and their habitat that are harmed or that may be jeopardized by a discharge.

[**527] "(3) REVISIONS AND AMENDMENTS.—The President may, from time to time, as the President deems advisable, revise or otherwise amend the National Contingency Plan.

"(4) ACTIONS IN ACCORDANCE WITH NATIONAL CONTINGENCY PLAN.—After publication of the National Contingency Plan, the removal of oil and hazardous substances and actions to minimize damage from oil and hazardous substance discharges shall, to the greatest extent possible, be in accordance with the National Contingency Plan."

(b) DEFINITIONS.—Section 311(a) of the Federal Water Pollution Control Act (*33 USC 1321*(a)) is amended

(1) in paragraph (8), by inserting "containment and" after "refers to"; and

(2) in paragraph (16) by striking the period at the end and inserting a semicolon;

(3) in paragraph (17)

(A) by striking "Otherwise" and inserting "otherwise"; and

(B) by striking the period at the end and inserting a semicolon; and

(4) by adding at the end the following:

"(18) 'Area Committee' means an Area Committee established under subsection (j);

"(19) 'Area Contingency Plan' means an Area Contingency Plan prepared under subsection (j);

"(20) 'Coast Guard District Response Group' means a Coast Guard District Response Group established under subsection (j);

"(21) 'Federal On-Scene Coordinator' means a Federal On-Scene Coordinator designated in the National Contingency Plan;

"(22) 'National Contingency Plan' means the National Contingency Plan prepared and published under subsection (d);

"(23) 'National Response Unit' means the National Response Unit established under subsection (j); and

"(24) 'worst case discharge' means

"(A) in the case of a vessel, a discharge in adverse weather conditions of its entire cargo; and

"(B) in the case of an offshore facility or onshore facility, the largest foreseeable discharge in adverse weather conditions."

(c) <*33 USC 1321* note> REVISION OF NATIONAL CONTINGENCY PLAN.—Not later than one year after the date of the enactment of this Act, the President shall revise and republish the National Contingency Plan prepared under section 311(c)(2) of the Federal Water Pollution Control Act (as in effect immediately before the date of the enactment of this Act) to implement the amendments made by this section and section 4202.

[*4202]
SEC. 4202. NATIONAL PLANNING AND RESPONSE SYSTEM.

(a) IN GENERAL.—Subsection (j) of section 311 of the Federal Water Pollution Control Act (*33 USC 1321*(j)) is amended

(1) by striking "(j)" and inserting the following:

"(j) NATIONAL RESPONSE SYSTEM.—";

(2) by moving paragraph (1) so as to begin immediately below the heading for subsection (j) (as added by paragraph (1) of this subsection);

[**528] (3) by moving paragraph (1) two ems to the right, so the left margin of that paragraph is aligned with the left margin of paragraph (2) of that subsection (as added by paragraph (6) of this subsection);

(4) in paragraph (1) by striking "(1)" and inserting the following:

"(1) IN GENERAL.—";

(5) by striking paragraph (2); and

(6) by adding at the end the following:

"(2) NATIONAL RESPONSE UNIT.—The Secretary of the department in which the Coast Guard is operating shall establish a National Response Unit at Elizabeth City, North Carolina. The Secretary, acting through the National Response Unit

"(A) shall compile and maintain a comprehensive computer list of spill removal resources, personnel, and equipment that is available worldwide and within the areas designated by the President pursuant to paragraph (4), which shall be available to Federal and State agencies and the public;

"(B) shall provide technical assistance, equipment, and other resources requested by a Federal On-Scene Coordinator;

"(C) shall coordinate use of private and public personnel and equipment to remove a worst case discharge, and to mitigate or prevent a substantial threat of such a discharge, from a vessel, offshore facility, or onshore facility operating in or near an area designated by the President pursuant to paragraph (4);

"(D) may provide technical assistance in the preparation of Area Contingency Plans required under paragraph (4);

"(E) shall administer Coast Guard strike teams established under the National Contingency Plan;

"(F) shall maintain on file all Area Contingency Plans approved by the President under this subsection; and

"(G) shall review each of those plans that affects its responsibilities under this subsection.

"(3) COAST GUARD DISTRICT RESPONSE GROUPS.

(A) The Secretary of the department in which the Coast Guard is operating shall establish in each Coast Guard district a Coast Guard District Response Group.

"(B) Each Coast Guard District Response Group shall consist of

"(i) the Coast Guard personnel and equipment, including firefighting equipment, of each port within the district;

"(ii) additional prepositioned equipment; and

"(iii) a district response advisory staff.

"(C) Coast Guard district response groups

"(i) shall provide technical assistance, equipment, and other resources when required by a Federal On-Scene Coordinator;

"(ii) shall maintain all Coast Guard response equipment within its district;

"(iii) may provide technical assistance in the preparation of Area Contingency Plans required under paragraph (4); and

"(iv) shall review each of those plans that affect its area of geographic responsibility.

[**529] "(4) AREA COMMITTEES AND AREA CONTINGENCY PLANS.

(A) There is established for each area designated by the President an Area Committee comprised of members appointed by the President from qualified personnel of Federal, State, and local agencies.

"(B) Each Area Committee, under the direction of the Federal On-Scene Coordinator for its area, shall

"(i) prepare for its area the Area Contingency Plan required under subparagraph (C);

"(ii) work with State and local officials to enhance the contingency planning of those officials and to assure preplanning of joint response efforts, including appropriate procedures for mechanical recovery, dispersal, shoreline cleanup, protection of sensitive environmental areas, and protection, rescue, and rehabilitation of fisheries and wildlife; and

"(iii) work with State and local officials to expedite decisions for the use of dispersants and other mitigating substances and devices.

"(C) Each Area Committee shall prepare and submit to the President for approval an Area Contingency Plan for its area. The Area Contingency Plan shall

"(i) when implemented in conjunction with the National Contingency Plan, be adequate to remove a worst case discharge, and to mitigate or prevent a substantial threat of such a discharge, from a vessel, offshore facility, or onshore facility operating in or near the area;

"(ii) describe the area covered by the plan, including the areas of special economic or environmental importance that might be damaged by a discharge;

"(iii) describe in detail the responsibilities of an owner or operator and of Federal, State, and local agencies in removing a discharge, and in mitigating or preventing a substantial threat of a discharge;

"(iv) list the equipment (including firefighting equipment), dispersants or other mitigating substances and devices, and personnel available to an owner or operator and Federal, State, and local agencies, to ensure an effective and immediate removal of a discharge, and to ensure mitigation or prevention of a substantial threat of a discharge;

"(v) describe the procedures to be followed for obtaining an expedited decision regarding the use of dispersants;

"(vi) describe in detail how the plan is integrated into other Area Contingency Plans and vessel, offshore facility, and onshore facility response plans approved under this subsection, and into operating procedures of the National Response Unit;

"(vii) include any other information the President requires; and

"(viii) be updated periodically by the Area Committee.

"(D) The President shall

"(i) review and approve Area Contingency Plans under this paragraph; and

"(ii) periodically review Area Contingency Plans so approved.

"(5) TANK VESSEL AND FACILITY RESPONSE PLANS.

(A) The President shall issue regulations which require an owner or [**530] operator of a tank vessel or facility described in subparagraph (B) to prepare and submit to the President a plan for responding, to the maximum extent practicable, to a worst case discharge, and to a substantial threat of such a discharge, of oil or a hazardous substance.

"(B) The tank vessels and facilities referred to in subparagraph (A) are the following:

"(i) A tank vessel, as defined under section 2101 of title 46, United States Code.

"(ii) An offshore facility.

"(iii) An onshore facility that, because of its location, could reasonably be expected to cause substantial harm to the environment by discharging into or on the navigable waters, adjoining shorelines, or the exclusive economic zone.

"(C) A response plan required under this paragraph shall

"(i) be consistent with the requirements of the National Contingency Plan and Area Contingency Plans;

"(ii) identify the qualified individual having full authority to implement removal actions, and require immediate communications between that individual and the appropriate Federal official and the persons providing personnel and equipment pursuant to clause (iii);

"(iii) identify, and ensure by contract or other means approved by the President the availability of, private personnel and equipment necessary to remove to the maximum extent practicable a worst case discharge (including a discharge resulting from fire or explosion), and to mitigate or prevent a substantial threat of such a discharge;

"(iv) describe the training, equipment testing, periodic unannounced drills, and response actions of persons on the vessel or at the facility, to be carried out under the plan to ensure the safety of the vessel or facility and to mitigate or prevent the discharge, or the substantial threat of a discharge;

"(v) be updated periodically; and

"(vi) be resubmitted for approval of each significant change.

"(D) With respect to any response plan submitted under this paragraph for an onshore facility that, because of its location, could reasonably be expected to cause significant and substantial harm to the environment by discharging into or on the navigable waters or adjoining shorelines or the exclusive economic zone, and with respect to each response plan submitted under this paragraph for a tank vessel or offshore facility, the President shall

"(i) promptly review such response plan;

"(ii) require amendments to any plan that does not meet the requirements of this paragraph;

"(iii) approve any plan that meets the requirements of this paragraph; and

"(iv) review each plan periodically thereafter.

"(E) A tank vessel, offshore facility, or onshore facility required to prepare a response plan under this subsection may not handle, store, or transport oil unless

"(i) in the case of a tank vessel, offshore facility, or onshore facility for which a response plan is reviewed by [**531] the President under subparagraph (D), the plan has been approved by the President; and

"(ii) the vessel or facility is operating in compliance with the plan.

"(F) Notwithstanding subparagraph (E), the President may authorize a tank vessel, offshore facility, or onshore facility to operate without a response plan approved under this paragraph, until not later than 2 years after the date of the submission to the President of a plan for the tank vessel or facility, if the owner or operator certifies that the owner or operator has ensured by contract or other means approved by the President the availability of private personnel and equipment necessary to respond, to the maximum extent practicable, to a worst case discharge or a substantial threat of such a discharge.

"(G) The owner or operator of a tank vessel, offshore facility, or onshore facility may not claim as a defense to liability under title I of the Oil Pollution Act of 1990 that the owner or operator was acting in accordance with an approved response plan.

"(H) The Secretary shall maintain, in the Vessel Identification System established under chapter 125 of title 46, United States Code, the dates of approval and review of a response plan under this paragraph for each tank vessel that is a vessel of the United States.

"(6) EQUIPMENT REQUIREMENTS AND INSPECTION.—Not later than 2 years after the date of enactment of this section, the President shall require—

"(A) periodic inspection of containment booms, skimmers, vessels, and other major equipment used to remove discharges; and

"(B) vessels operating on navigable waters and carrying oil or a hazardous substance in bulk as cargo to carry appropriate removal equipment that employs the best technology economically feasible and that is compatible with the safe operation of the vessel.

"(7) AREA DRILLS.—The President shall periodically conduct drills of removal capability, without prior notice, in areas for which Area Contingency Plans are required under this subsection and under relevant tank vessel and facility response plans. The drills may include participation by Federal, State, and local agencies, the owners and operators of vessels and facilities in the area, and private industry. The President may publish annual reports on these drills, including assessments of the effectiveness of the plans and a list of amendments made to improve plans.

"(8) UNITED STATES GOVERNMENT NOT LIABLE.—The United States Government is not liable for any damages arising from its actions or omissions relating to any response plan required by this section."

(b) <*33 USC 1321* note> IMPLEMENTATION.

(1) AREA COMMITTEES AND CONTINGENCY PLANS.

(A) Not later than 6 months after the date of the enactment of this Act, the President shall designate the areas for which Area Committees are established under section 311(j)(4) of the Federal Water Pollution Control Act, as amended by this Act. In designating such areas, the President shall ensure that all navigable waters, adjoining shorelines, and waters of the exclusive economic zone are subject to an Area Contingency Plan under that section.

[**532] (B) Not later than 18 months after the date of the enactment of this Act, each Area Committee established under that section shall submit to the President the Area Contingency Plan required under that section.

(C) Not later than 24 months after the date of the enactment of this Act, the President shall

(i) promptly review each plan;

(ii) require amendments to any plan that does not meet the requirements of section 311(j)(4) of the Federal Water Pollution Control Act; and

(iii) approve each plan that meets the requirements of that section.

(2) NATIONAL RESPONSE UNIT.—Not later than one year after the date of the enactment of this Act, the Secretary of the department in which the Coast Guard is operating shall establish a National Response Unit in accordance with section 311(j)(2) of the Federal Water Pollution Control Act, as amended by this Act.

(3) COAST GUARD DISTRICT RESPONSE GROUPS.—Not later than 1 year after the date of the enactment of this Act, the Secretary of the department in which the Coast Guard is operating shall establish Coast Guard District Response Groups in accordance with section 311(j)(3) of the Federal Water Pollution Control Act, as amended by this Act.

(4) TANK VESSEL AND FACILITY RESPONSE PLANS; TRANSITION PROVISION; EFFECTIVE DATE OF PROHIBITION.

(A) Not later than 24 months after the date of the enactment of this Act, the President shall issue regulations for tank vessel and facility response plans under section 311(j)(5) of the Federal Water Pollution Control Act, as amended by this Act.

(B) During the period beginning 30 months after the date of the enactment of this paragraph and ending 36 months after that date of enactment, a tank vessel or facility for which a response plan is required to be prepared under section 311(j)(5) of the Federal Water Pollution Control Act, as amended by this Act, may not handle, store, or transport oil unless the owner or operator thereof has submitted such a plan to the President.

(C) Subparagraph (E) of section 311(j)(5) of the Federal Water Pollution Control Act, as amended by this Act, shall take effect 36 months after the date of the enactment of this Act.

(c) STATE LAW NOT PREEMPTED.—Section 311(o)(2) of the Federal Water Pollution Control Act (*33 USC 1321*(o)(2)) is amended by inserting before the period the following: ", or with respect to any removal activities related to such discharge".

[*4203]
SEC. 4203. <*14 USC 92* note> COAST GUARD VESSEL DESIGN.

The Secretary shall ensure that vessels designed and constructed to replace Coast Guard buoy tenders are equipped with oil skimming systems that are readily available and operable, and that complement the primary mission of servicing aids to navigation.

[*4204]
SEC. 4204. DETERMINATION OF HARMFUL QUANTITIES OF OIL AND HAZARDOUS SUBSTANCES.

Section 311(b)(4) of the Federal Water Pollution Control Act (*33 USC 1321*(b)(4)) is amended by inserting "or the environment" after "the public health or welfare".

[**533] [*4205]
SEC. 4205. COASTWISE OIL SPILL RESPONSE COOPERATIVES.

Section 12106 of title 46, United States Code, is amended by adding at the end the following:

"(d)(1) A vessel may be issued a certificate of documentation with a coastwise endorsement if

"(A) the vessel is owned by a not-for-profit oil spill response cooperative or by members of such a cooperative who dedicate the vessel to use by the cooperative;

"(B) the vessel is at least 50 percent owned by persons or entities described in section 12102(a) of this title;

"(C) the vessel otherwise qualifies under section 12106 to be employed in the coastwise trade; and

"(D) use of the vessel is restricted to

"(i) the deployment of equipment, supplies, and personnel to recover, contain, or transport oil discharged into the navigable waters of the United States, or within the Exclusive Economic Zone, or

"(ii) for training exercises to prepare to respond to such a discharge.

"(2) For purposes of the first proviso of section 27 of the Merchant Marine Act, 1920, section 2 of the Shipping Act of 1916, and section 12102(a) of this title, a vessel meeting the criteria of this subsection shall be considered to be owned exclusively by citizens of the United States."

SUBTITLE C—PENALTIES AND MISCELLANEOUS

[*4301]
SEC. 4301. FEDERAL WATER POLLUTION CONTROL ACT PENALTIES.

(a) NOTICE TO STATE AND FAILURE TO REPORT.—Section 311(b)(5) of the Federal Water Pollution Control Act (*33 USC 1321*(b)(5)) is amended

(1) by inserting after the first sentence the following: "The Federal agency shall immediately notify the appropriate State agency of any State which is, or may reasonably be expected to be, affected by the discharge of oil or a hazardous substance.";

(2) by striking "fined not more than $10,000, or imprisoned for not more than one year, or both" and inserting "fined in accordance with title 18, United States Code, or imprisoned for not more than 5 years, or both"; and

(3) in the last sentence by

(A) striking "or information obtained by the exploitation of such notification"; and

(B) inserting "natural" before "person".

(b) PENALTIES FOR DISCHARGES AND VIOLATIONS OF REGULATIONS.—Section 311(b) of the Federal Water Pollution Control Act (*33 USC 1321*(b)) is amended by striking paragraph (6) and inserting the following new paragraphs:

"(6) ADMINISTRATIVE PENALTIES.

"(A) VIOLATIONS.—Any owner, operator, or person in charge of any vessel, onshore facility, or offshore facility

"(i) from which oil or a hazardous substance is discharged in violation of paragraph (3), or

"(ii) who fails or refuses to comply with any regulation issued under subsection (j) to which that owner, operator, or person in charge is subject,

[**534] may be assessed a class I or class II civil penalty by the Secretary of the department in which the Coast Guard is operating or the Administrator.

"(B) CLASSES OF PENALTIES.

"(i) CLASS I.—The amount of a class I civil penalty under subparagraph (A) may not exceed $10,000 per violation, except that the maximum amount of any class I civil penalty under this subparagraph shall not exceed $25,000. Before assessing a civil penalty under this clause, the Administrator or Secretary, as the case may be, shall give to the person to be assessed such penalty written notice of the Administrator's or Secretary's proposal to assess the penalty and the opportunity to request, within 30 days of the date the notice is received by such person, a hearing on the proposed penalty. Such hearing shall not be subject to section 554 or 556 of title 5, United States Code, but shall provide a reasonable opportunity to be heard and to present evidence.

"(ii) CLASS II.—The amount of a class II civil penalty under subparagraph (A) may not exceed $10,000 per day for each day during which the violation continues; except that the maximum amount of any class II civil penalty under this subparagraph shall not exceed $125,000. Except as otherwise provided in this subsection, a class II civil penalty shall be assessed and collected in the same manner, and subject to the same provisions, as in the case of civil penalties assessed and collected after notice and opportunity for a hearing on the record in accordance with section 554 of title 5, United States Code. The Administrator and Secretary may issue rules for discovery procedures for hearings under this paragraph.

"(C) RIGHTS OF INTERESTED PERSONS.

"(i) PUBLIC NOTICE.—Before issuing an order assessing a class II civil penalty under this paragraph the Administrator or Secretary, as the case may be, shall provide public notice of and reasonable opportunity to comment on the proposed issuance of such order.

"(ii) PRESENTATION OF EVIDENCE.—Any person who comments on a proposed assessment of a class II civil penalty under this paragraph shall be given notice of any hearing held under this paragraph and of the order assessing such penalty. In any hearing held under this paragraph, such person shall have a reasonable opportunity to be heard and to present evidence.

"(iii) RIGHTS OF INTERESTED PERSONS TO A HEARING.—If no hearing is held under subparagraph (B) before issuance of an order assessing a class II civil penalty under this paragraph, any person who commented on the proposed assessment may petition, within 30 days after the issuance of such order, the Administrator or Secretary, as the case may be, to set aside such order and to provide a hearing on the penalty. If the evidence presented by the petitioner in support of the petition is material and was not considered in the issuance of the order, the Administrator or Secretary shall immediately [**535] set aside such order and provide a hearing in accordance with subparagraph (B)(ii). If the Administrator or Secretary denies a hearing under

this clause, the Administrator or Secretary shall provide to the petitioner, and publish in the Federal Register, notice of and the reasons for such denial.

"(D) FINALITY OF ORDER.—An order assessing a class II civil penalty under this paragraph shall become final 30 days after its issuance unless a petition for judicial review is filed under subparagraph (G) or a hearing is requested under subparagraph (C)(iii). If such a hearing is denied, such order shall become final 30 days after such denial.

"(E) EFFECT OF ORDER.—Action taken by the Administrator or Secretary, as the case may be, under this paragraph shall not affect or limit the Administrator's or Secretary's authority to enforce any provision of this Act; except that any violation

"(i) with respect to which the Administrator or Secretary has commenced and is diligently prosecuting an action to assess a class II civil penalty under this paragraph, or

"(ii) for which the Administrator or Secretary has issued a final order assessing a class II civil penalty not subject to further judicial review and the violator has paid a penalty assessed under this paragraph, shall not be the subject of a civil penalty action under section 309(d), 309(g), or 505 of this Act or under paragraph (7).

"(F) EFFECT OF ACTION ON COMPLIANCE.—No action by the Administrator or Secretary under this paragraph shall affect any person's obligation to comply with any section of this Act.

"(G) JUDICIAL REVIEW.—Any person against whom a civil penalty is assessed under this paragraph or who commented on the proposed assessment of such penalty in accordance with subparagraph (C) may obtain review of such assessment

"(i) in the case of assessment of a class I civil penalty, in the United States District Court for the District of Columbia or in the district in which the violation is alleged to have occurred, or

"(ii) in the case of assessment of a class II civil penalty, in United States Court of Appeals for the District of Columbia Circuit or for any other circuit in which such person resides or transacts business, by filing a notice of appeal in such court within the 30-day period beginning on the date the civil penalty order is issued and by simultaneously sending a copy of such notice by certified mail to the Administrator or Secretary, as the case may be, and the Attorney General. The Administrator or Secretary shall promptly file in such court a certified copy of the record on which the order was issued. Such court shall not set aside or remand such order unless there is not substantial evidence in the record, taken as a whole, to support the finding of a violation or unless the Administrator's or Secretary's assessment of the penalty constitutes an abuse of discretion and shall not impose additional civil [**536] penalties for the same violation unless the Administrator's or Secretary's assessment of the penalty constitutes an abuse of discretion.

"(H) COLLECTION.—If any person fails to pay an assessment of a civil penalty

"(i) after the assessment has become final, or

"(ii) after a court in an action brought under subparagraph (G) has entered a final judgment in favor of the Administrator or Secretary, as the case may be, the Administrator or Secretary shall request the Attorney General to bring a civil action in an appropriate district court to recover the amount assessed (plus interest at currently prevailing rates from the date of the final order or the date of the final judgment, as the case may be). In such an action, the validity, amount, and appropriateness of such penalty shall not be subject to review. Any person who fails to pay on a timely basis the amount of an assessment of a civil penalty as described in the first sentence of this subparagraph shall be required to pay, in addition to such amount and interest, attorneys fees and costs for collection proceedings and a quarterly nonpayment penalty for each quarter during which such failure to pay persists. Such nonpayment penalty shall be in an amount equal to 20 percent of the aggregate amount of such person's penalties and nonpayment penalties which are unpaid as of the beginning of such quarter.

"(I) SUBPOENAS.—The Administrator or Secretary, as the case may be, may issue subpoenas for the attendance and testimony of witnesses and the production of relevant papers, books, or documents in connection with hearings under this paragraph. In case of contumacy or refusal to obey a subpoena issued pursuant to this subparagraph and served upon any person, the district court of the United States for any district in which such person is found, resides, or transacts business, upon application by the United States and after notice to such person, shall have jurisdiction to issue an order requiring such person to appear and give testimony before the administrative law judge or to appear and produce documents before the administrative law judge, or both, and any failure to obey such order of the court may be punished by such court as a contempt thereof.

"(7) CIVIL PENALTY ACTION.

"(A) DISCHARGE, GENERALLY.—Any person who is the owner, operator, or person in charge of any vessel, onshore facility, or offshore facility from which oil or a hazardous substance is discharged in violation of paragraph (3), shall be subject to a civil penalty in an amount up to $25,000 per day of violation or an amount up to $1,000 per barrel of oil or unit of reportable quantity of hazardous substances discharged.

"(B) FAILURE TO REMOVE OR COMPLY.—Any person described in subparagraph (A) who, without sufficient cause

"(i) fails to properly carry out removal of the discharge under an order of the President pursuant to subsection (c): or

"(ii) fails to comply with an order pursuant to subsection (e)(1)(B);

[**537] shall be subject to a civil penalty in an amount up to $25,000 per day of violation or an amount up to 3 times the costs incurred by the Oil Spill Liability Trust Fund as a result of such failure.

"(C) FAILURE TO COMPLY WITH REGULATION.—Any person who fails or refuses to comply with any regulation issued under subsection (j) shall be subject to a civil penalty in an amount up to $25,000 per day of violation.

"(D) GROSS NEGLIGENCE.—In any case in which a violation of paragraph (3) was the result of gross negligence or willful misconduct of a person described in subparagraph (A), the person shall be subject to a civil penalty of not less than $100,000, and not more than $3,000 per barrel of oil or unit of reportable quantity of hazardous substance discharged.

"(E) JURISDICTION.—An action to impose a civil penalty under this paragraph may be brought in the district court of the United States for the district in which the defendant is located, resides, or is doing business, and such court shall have jurisdiction to assess such penalty.

"(F) LIMITATION.—A person is not liable for a civil penalty under this paragraph for a discharge if the person has been assessed a civil penalty under paragraph (6) for the discharge.

"(8) DETERMINATION OF AMOUNT.—In determining the amount of a civil penalty under paragraphs (6) and (7), the Administrator, Secretary, or the court, as the case may be, shall consider the seriousness of the violation or violations, the economic benefit to the violator, if any, resulting from the violation, the degree of culpability involved, any other penalty for the same incident, any history of prior violations, the nature, extent, and degree of success of any efforts of the violator to minimize or mitigate the effects of the discharge, the economic impact of the penalty on the violator, and any other matters as justice may require.

"(9) MITIGATION OF DAMAGE.—In addition to establishing a penalty for the discharge of oil or a hazardous substance, the Administrator or the Secretary of the department in which the Coast Guard is operating may act to mitigate the damage to the public health or welfare caused by such discharge. The cost of such mitigation shall be deemed a cost incurred under subsection (c) of this section for the removal of such substance by the United States Government.

"(10) RECOVERY OF REMOVAL COSTS.—Any costs of removal incurred in connection with a discharge excluded by subsection (a)(2)(C) of this section shall be recoverable from the owner or operator of the source of the discharge in an action brought under section 309(b) of this Act.

"(11) LIMITATION.—Civil penalties shall not be assessed under both this section and section 309 for the same discharge."

(c) CRIMINAL PENALTIES.—Section 309(c) of the Federal Water Pollution Control Act (*33 USC 1319*(c)) is amended by inserting after "308," each place it appears the following: "311(b)(3)"

[*4302]
SEC. 4302. OTHER PENALTIES.

(a) NEGLIGENT OPERATIONS.—Section 2302 of title 46. United States Code, is amended

[**538] (1) in subsection (b) by striking "shall be fined not more than $5,000, imprisoned for not more than one year, or both.", and inserting "commits a class A misdemeanor"; and

(2) in subsection (c)

(A) by striking ", shall be" in the matter preceding paragraph (1);

(B) by inserting "is" before "liable" in paragraph (1); and

(C) by amending paragraph (2) to read as follows:

"(2) commits a class A misdemeanor."

(b) INSPECTIONS.—Section 3318 of title 46, United States Code, is amended

(1) in subsection (b) by striking "shall be fined not more than $10,000, imprisoned for not more than 5 years, or both." and inserting "commits a class D felony.";

(2) in subsection (c) by striking "shall be fined not more than $5,000, imprisoned for not more than 5 years, or both." and inserting "commits a class D felony.";

(3) in subsection (d) by striking "shall be fined not more than $5,000, imprisoned for not more than 5 years, or both." and inserting "commits a class D felony.";

(4) in subsection (e) by striking "shall be fined not more than $10,000, imprisoned for not more than 2 years, or both." and inserting "commits a class A misdemeanor."; and

(5) in the matter preceding paragraph (1) of subsection (f) by striking "shall be fined not less than $1,000 but not more than $10,000, and imprisoned for not less than 2 years but not more than 5 years," and inserting "commits a class D felony."

(c) CARRIAGE OF LIQUID BULK DANGEROUS CARGOES.—Section 3718 of title 46, United States Code, is amended

(1) in subsection (b) by striking "shall be fined not more than $50,000, imprisoned for not more than 5 years, or both." and inserting "commits a class D felony."; and

(2) in subsection (c) by striking "shall be fined not more than $100,000, imprisoned for not more than 10 years, or both." and inserting "commits a class C felony."

(d) LOAD LINES.—Section 5116 of title 46, United States Code, is amended

(1) in subsection (d) by striking "shall be fined not more than $10,000, imprisoned for not more than one year, or both." and inserting "commits a class A misdemeanor."; and

(2) in subsection (e) by striking "shall be fined not more than $10,000, imprisoned for not more than 2 years, or both." and inserting "commits a class A misdemeanor."

(e) COMPLEMENT OF INSPECTED VESSELS.—Section 8101 of title 46, United States Code, is amended

(1) in subsection (e) by striking "$50" and inserting "$1,000";

(2) in subsection (f) by striking "$100, or, for a deficiency of a licensed individual, a penalty of $500." and inserting "$10,000."; and

(3) in subsection (g) by striking "$500." and inserting "$10,000."

(f) WATCHES.—Section 8104 of title 46, United States Code, is amended

(1) in subsection (i) by striking "$100." and inserting "$10,000."; and

(2) in subsection (j) by striking "$500." and inserting "$10,000."

[**539] (g) COASTWISE PILOTAGE.—Section 8502 of title 46, United States Code, is amended

(1) in subsection (e) by striking "$500." and inserting "$10,000."; and

(2) in subsection (f) by striking "$500." and inserting "$10,000."

(h) FOREIGN COMMERCE PILOTAGE.—Section 8503(e) of title 46, United States Code, is amended by striking "shall be fined not more than $50,000, imprisoned for not more than five years, or both." and inserting "commits a class D felony."

(i) CREW REQUIREMENTS.—Section 8702(e) of title 46, United States Code, is amended by striking "$500." and inserting "$10,000."

(j) PORTS AND WATERWAYS SAFETY ACT.—Section 13(b) of the Port and Waterways Safety Act (*33 USC 1232*(b)) is amended

(1) in paragraph (1) by striking "shall be fined not more than $50,000 for each violation or imprisoned for not more than five years, or both." and inserting "commits a class D felony."; and

(2) in paragraph (2) by striking "shall, in lieu of the penalties prescribed in paragraph (1), be fined not more than $100,000, or imprisoned for not more than 10 years, or both." and inserting "commits a class C felony."

(k) VESSEL NAVIGATION.—Section 4 of the Act of April 28, 1908 (*33 USC 1236*) is amended

(1) in subsection 6) by striking "$500." and inserting "$5,000.";

(2) in subsection (c) by striking "$500," and inserting "$5,000"; and

(3) in subsection (d) by striking "$250." and inserting "$2,500."

(l) INTERVENTION ON THE HIGH SEAS ACT.—section 12(a) of the Intervention of the High Seas Act (33 *USC 1481*(a)) is amended

(1) in the matter preceding paragraph (1) by striking "Any person who" and inserting "A person commits a class A misdemeanor if that person"; and

(2) in paragraph (3) by striking ", shall be fined not more than $10,000 or imprisoned not more than one year, or both".

(m) DEEPWATER PORT ACT OF 1974.—Section 15(a) of the Deepwater Port Act of 1974 (*33 USC 1514*(a)) is amended by striking "shall on conviction be fined not more than $25,000 for each day of violation or imprisoned for not more than 1 year, or both." and inserting "commits a class A misdemeanor for each day of violation."

(n) ACT TO PREVENT POLLUTION FROM SHIPS.—Section 9(a) of the Act to Prevent Pollution from Ships (*33 USC 1908*(a)) is amended by striking "shall, for each violation, be fined not more than $50,000 or be imprisoned for not more than 5 years, or both." and inserting "commits a class D felony."

[*4303]
SEC. 4303. <*33 USC 2716a*> FINANCIAL RESPONSIBILITY CIVIL PENALTIES.

(a) ADMINISTRATIVE.—Any person who, after notice and an opportunity for a hearing, is found to have failed to comply with the requirements of section 1016 or the regulations issued under that section, or with a denial or detention order issued under subsection (c)(2) of that section, shall be liable to the United States for a civil penalty, not to exceed $25,000 per day of violation. The amount of the civil penalty shall be assessed by the President by written notice. In determining the amount of the penalty, the President [**540] shall take into account the nature, circumstances, extent, and gravity of the violation, the degree of culpability, any history of prior violation, ability to pay, and such other matters as justice may require. The President may compromise, modify, or remit, with or without conditions, any civil penalty which is subject to imposition or which had been imposed under this paragraph. If any person fails to pay an assessed civil penalty after it has become final, the President may refer the matter to the Attorney General for collection.

(b) JUDICIAL.—In addition to, or in lieu of, assessing a penalty under subsection (a), the President may request the Attorney General to secure such relief as necessary to compel compliance with this section 1016, including a judicial order terminating operations. The district courts of the United States shall have jurisdiction to grant any relief as the public interest and the equities of the case may require.

[*4304]
SEC. 4304. <*26 USC 9509* note> DEPOSIT OF CERTAIN PENALTIES INTO OIL SPILL LIABILITY TRUST FUND.

Penalties paid pursuant to section 311 of the Federal Water Pollution Control Act, section 309(c) of that Act, as a result of violations of section 311 of that Act, and the Deepwater Port Act of 1974, shall be deposited in the Oil Spill Liability Trust Fund created under section 9509 of the Internal Revenue Code of 1986 (*26 USC 9509*).

[*4305]
SEC. 4305. INSPECTION AND ENTRY.

Section 311(m) of the Federal Water Pollution Control Act (*33 USC 1321*(m)) is amended to read as follows:

"(m) ADMINISTRATIVE PROVISIONS.

"(1) FOR VESSELS.—Anyone authorized by the President to enforce the provisions of this section with respect to any vessel may, except as to public vessels

"(A) board and inspect any vessel upon the navigable waters of the United States or the waters of the contiguous zone,

"(B) with or without a warrant, arrest any person who in the presence or view of the authorized person violates the provisions of this section or any regulation issued thereunder, and

"(C) execute any warrant or other process issued by an officer or court of competent jurisdiction.

"(2) FOR FACILITIES.

"(A) RECORDKEEPING.—Whenever required to carry out the purposes of this section, the Administrator or the Secretary of the Department in which the Coast Guard is operating shall require the owner or operator of a facility to which this section applies to establish and maintain such records, make such reports, install, use, and maintain such monitoring equipment and methods, and provide such other information as the Administrator or Secretary, as the case may be, may require to carry out the objectives of this section.

"(B) ENTRY AND INSPECTION.—Whenever required to carry out the purposes of this section, the Administrator or the Secretary of the Department in which the Coast Guard is operating or an authorized representative of the Administrator [**541] or Secretary, upon presentation of appropriate credentials, may

"(i) enter and inspect any facility to which this section applies, including any facility at which any records are required to be maintained under subparagraph (A); and

"(ii) at reasonable times, have access to and copy any records, take samples, and inspect any monitoring equipment or methods required under subparagraph (A).

"(C) ARRESTS AND EXECUTION OF WARRANTS.—Anyone authorized by the Administrator or the Secretary of the department in which the Coast Guard is operating to enforce the provisions of this section with respect to any facility may

"(i) with or without a warrant, arrest any person who violates the provisions of this section or any regulation issued thereunder in the presence or view of the person so authorized; and

"(ii) execute any warrant or process issued by an officer or court of competent jurisdiction.

"(D) PUBLIC ACCESS.—Any records, reports, or information obtained under this paragraph shall be subject to the same public access and disclosure requirements which are applicable to records, reports, and information obtained pursuant to section 308."

[*4306]
SEC. 4306. CIVIL ENFORCEMENT UNDER FEDERAL WATER POLLUTION CONTROL ACT.

Section 311(e) of the Federal Water Pollution Control Act (*33 USC 1321*) is amended to read as follows:

"(e) CIVIL ENFORCEMENT.

"(1) ORDERS PROTECTING PUBLIC HEALTH.—In addition to any action taken by a State or local government, when the President determines that there may be an imminent and substantial threat to the public health or welfare of the United States, including fish, shellfish, and wildlife, public and private property, shorelines, beaches, habitat, and other living and nonliving natural resources under the jurisdiction or control of the United States, because of an actual or threatened discharge of oil or a hazardous substance from a vessel or facility in violation of subsection (b), the President may

"(A) require the Attorney General to secure any relief from any person, including the owner or operator of the vessel or facility, as may be necessary to abate such endangerment; or

"(B) after notice to the affected State, take any other action under this section, including issuing administrative orders, that may be necessary to protect the public health and welfare.

"(2) JURISDICTION OF DISTRICT COURTS.—The district courts of the United States shall have jurisdiction to grant any relief under this subsection that the public interest and the equities of the case may require."

TITLE IX—AMENDMENTS TO OIL SPILL LIABILITY TRUST FUND, ETC.

[*9001]
SEC. 9001. AMENDMENTS TO OIL SPILL LIABILITY TRUST FUND.

(a) TRANSFERS TO TRUST FUND.—Subsection (b) of section 9509 of the Internal Revenue Code of 1986 <*26 USC 9509*> is amended by striking all that follows paragraph (1) and inserting the following:

"(2) amounts recovered under the Oil Pollution Act of 1990 for damages to natural resources which are required to be deposited in the Fund under section 1006(f) of such Act,

"(3) amounts recovered by such Trust Fund under section 1015 of such Act,

"(4) amounts required to be transferred by such Act from the revolving fund established under section 311(k) of the Federal Water Pollution Control Act,

"(5) amounts required to be transferred by the Oil Pollution Act of 1990 from the Deepwater Port Liability Fund established under section 18(f) of the Deepwater Port Act of 1974,

"(6) amounts required to be transferred by the Oil Pollution Act of 1990 from the Offshore Oil Pollution Compensation Fund established under section 302 of the Outer Continental Shelf Lands Act Amendments of 1978,

"(7) amounts required to be transferred by the Oil Pollution Act of 1990 from the Trans-Alaska Pipeline Liability Fund established under section 204 of the Trans-Alaska Pipeline Authorization Act, and

"(8) any penalty paid pursuant to section 311 of the Federal Water Pollution Control Act, section 309(c) of such Act (as a result of violations of such section 311), the Deepwater Port Act of 1974, or section 207 of the Trans-Alaska Pipeline Authorization Act."

(b) EXPENDITURES FROM TRUST FUND.—Paragraph (1) of section 9509(c) of such Code is amended to read as follows:

(1) EXPENDITURE PURPOSES.—Amounts in the Oil Spill Liability Trust Fund shall be available, as provided in appropriation [**574] Acts or section 6002(b) of the Oil Pollution Act of 1990, only for purposes of making expenditures

"(A) for the payment of removal costs and other costs, expenses, claims, and damages referred to in section 1012 of such Act,

"(B) to carry out sections 5 and 7 of the Intervention on the High Seas Act relating to oil pollution or the substantial threat of oil pollution,

"(C) for the payment of liabilities incurred by the revolving fund established by section 311(k) of the Federal Water Pollution Control Act,

"(D) to carry out subsections (b), (c), (d), (j), and (l) of section 311 of the Federal Water Pollution Control Act with respect to prevention, removal, and enforcement related to oil discharges (as defined in such section),

"(E) for the payment of liabilities incurred by the Deepwater Port Liability Fund, and

"(F) for the payment of liabilities incurred by the Offshore Oil Pollution Compensation Fund."

(c) INCREASE IN EXPENDITURES PERMITTED PER INCIDENT.—Subparagraph (A) of section 9509(c)(2) of such Code <*26 USC 9509*> is amended

(1) by striking "$500,000,000" each place it appears and inserting "$1,000,000,000", and

(2) by striking "$250,000,000" and inserting "$500,000,000".

(d) INCREASE IN BORROWING AUTHORITY.

(1) INCREASE IN BORROWING PERMITTED.—Paragraph (2) of section 9509(d) of such Code is amended by striking "$500,000,000" and inserting "$1,000,000,000".

(2) CHANGE IN FINAL REPAYMENT DATE.—Subparagraph (B) of section 9509(d)(3) of such Code is amended by striking "December 31, 1991" and inserting "December 31, 1994".

(e) OTHER CHANGES.

(1) Paragraph (2) of section 9509(e) of such Code is amended by striking "Comprehensive Oil Pollution Liability and Compensation Act" and inserting "Oil Pollution Act of 1990".

(2) Subparagraph (B) of section 9509(c)(2) of such Code is amended by striking "described in paragraph (1)(A)(i)" and inserting "of removal costs".

(3) Subsection (f) of section 9509 of such Code is amended to read as follows:

"(f) REFERENCES TO OIL POLLUTION ACT OF 1990.—Any reference in this section to the Oil Pollution Act of 1990 or any other Act referred to in a subparagraph of subsection (c)(1) shall be treated as a reference to such Act as in effect on the date of the enactment of this subsection."

[*9002]

SEC. 9002. CHANGES RELATING TO OTHER FUNDS.

(a) REPEAL OF PROVISION RELATING TO TRANSFERS TO OIL SPILL LIABILITY FUND.—Subsection (d) of section 4612 of the Internal Revenue Code of 1986 <*26 USC 4612*> is amended by striking the last sentence.

(b) CREDIT AGAINST OIL SPILL RATE ALLOWED ON AFFILIATED GROUP BASIS.—Subsection (d) of section 4612 of such Code is amended by adding at the end thereof the following new sentence: "For purposes of this subsection, all taxpayers which would be members of the same affiliated group (as defined in section 1504(a)) if section [**575] 1504(a)(2) were applied by substituting '100 percent' for '80 percent' shall be treated as 1 taxpayer."

Speaker of the House of Representatives.

Vice President of the United States and President of the Senate.

Appendix III

National Response System—US—Best Response Model*

The success of a response is frequently measured in a variety of ways including initial reaction, public perception, physical and/or monetary damage to the environment, amount spent on the response, effectiveness of restoration efforts and other, often conflicting or contradictory measures. A recent review of responses since the *Exxon Valdez* reflected many positive organizational and technological advances as well as other areas with unsolved problems. Despite these innovations the authors have found no comprehensive system, agreed upon by the response community, that systematically evaluates the success of the response effort.

This appendix proposes a model for response evaluation that highlights six key areas that must be addressed to adequately define success before, during and after a response. The areas are: (1) human health and safety; (2) natural environment; (3) economic impact; (4) public communication; (5) stakeholder service and support; and (6) response organization. Each of these areas has critical success factors. By assessing these critical success factors, as part of a Balanced Response Scorecard, a response organization has the chance to modify actions during the response to ensure the best opportunity for success. Once fully integrated, the response evaluation model could influence the response process and community relations, and lead to increasingly effective response planning and operations.

Minimizing consequences of an incident requires not only a sound management system, good people, and equipment, but also goals that can be measured against agreed upon standards or criteria. This baseline, although driven by the subtleties of each geographic area, will provide the opportunity for response organizations and communities to reach consensus on success, thereby improving our ability to protect our national interests and building an increased sense of shared stewardship.

* Kuchin, Joseph T. and L.L. Hereth 1999. Measuring Response: A Balanced Response Scorecard for Evaluating Success. In Proceedings of the 1999 International Oil Spill Conference, Seattle, Washington. American Petroleum Institute, Washington, DC, pp. 685–690.

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Introduction

For many years there has been an ongoing discussion of how to define success in emergency response. This appendix is an update of work in the US Coast Guard to identify the principal measures used to determine success in emergency response and to establish a methodology to evaluate effectiveness in each of those areas.

This appendix begins with a discussion of the US National Response System (NRS). It identifies the goal of that system and introduces the concept of "Best Response". The "Best Response" model graphically represents the business of emergency response. It is followed by a description of the methodology used to develop a measurement plan. The measurement plan relies on the concepts of key business drivers, critical success factors and a survey instrument to evaluate the complex process of crisis response.

Although survey norms will evolve over time, three immediate benefits for the "Best Response" measurement scheme and survey are offered:

- To improve response community alignment;
- To serve as a guide or "Balanced Response Scorecard" during a response; and
- To serve as a post response self-evaluation tool.

The appendix elaborates on the use of these concepts during a response and proposes their use as part of a Balanced Response Scorecard. Using the "Best Response" measurement scheme, the suggested scorecard blends traditional operational details with an awareness of progress towards outcomes that benefit national interests. This broader view of success will have a beneficial impact on our ability to more effectively prepare for and deliver emergency response with positive, meaningful results.

The US National Response System (NRS)

The US National Response System was established in the late 1960s. It was created in answer to a number of large-scale pollution incidents that highlighted the nation's need to provide a mechanism to foster support, cooperation and collaboration among all response entities, both industry and government (federal, state, local) in order to provide the best possible response. Figure III.1 is a summary view of the National Response System. The foundation of the system is the components, or players—industry and government; the business of the system is "Best Response"; and the goal of the system is the protection of those elements of the National Interests summarized here as People, the Environment, Property and the Economy.

The Goal of the NRS

"Minimize the Consequences of Pollution Incidents"—1999 US Coast Guard Performance Plan

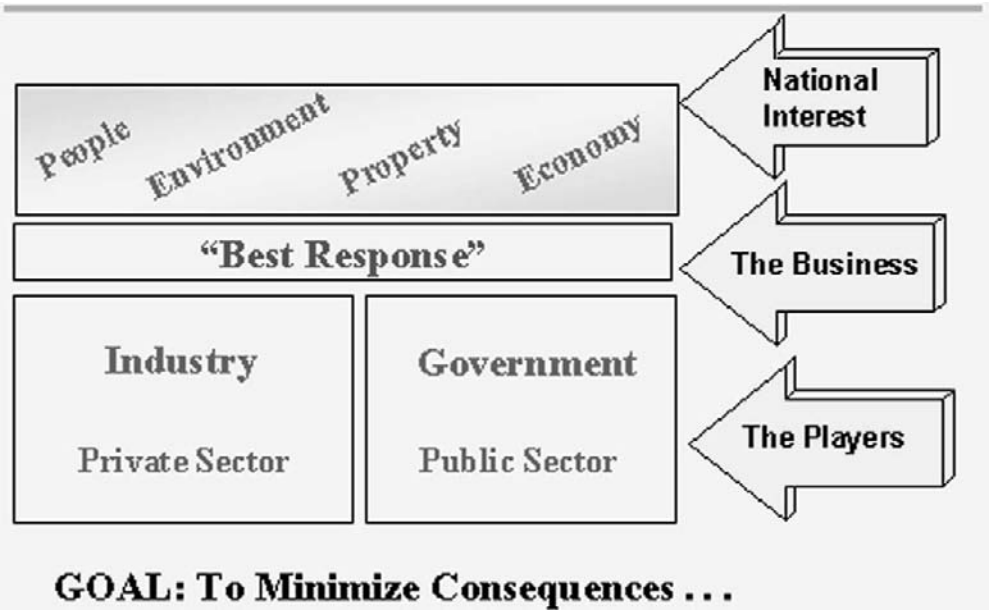


Fig. III.1. National response system (NRS).

This is the primary goal of the NRS when responding to oil and hazmat incidents. This simple statement focuses on the actual outcome that the NRS is chartered to deliver to the nation. It has been accepted by the US Coast Guard as its goal in the area of pollution response.

The four categories representing the National Interests are designed to be broad enough to include everything the response organization is trying to protect. These categories include:

(1) *People*—people, their welfare and their interests (social, cultural, archeological and recreational);
(2) *Environment*—the natural environment;
(3) *Property*—the property people own; and
(4) *Economy*—those economic systems that sustain local, regional or national interests.

The Players of the NRS

Figure III.1 shows that the response system includes both private and public sector representatives. In the US, the responsible party (supported by representatives or contractors) and designated government agencies (federal, state and local) each have jurisdiction and on-scene functional responsibilities. Therefore, management responsibilities are normally carried out using a Unified Command (UC) structure and an Incident Command System organization.

The Business of the NRS—"Best Response"

"Response to a major pollution emergency is like standing up, overnight, a multi-million dollar corporation with three (or more) partners (Unified Command) that don't particularly want to be in business together."

This statement captures and characterizes the essence of the challenge of responding to a major pollution emergency in the United States. The tremendous variety of entities (agencies, companies, organizations, individuals, etc.) that are partners, customers, suppliers and stakeholders in the business of emergency response have always posed huge challenges to emergency responders. Over the years, balancing their needs has spawned considerable debate and conflict as response managers wrestled with satisfying all legitimate interests in the midst of emergency response.

In an effort to establish a holistic view—a mental model—of this very complex business, and provide a single common view of what a response is and what it looks like, the Coast Guard measurement development team created a graphic to depict the business of response. Figure III.2, "Best Response (Coastal Maritime Oil Spill)" is that model. The model does not pretend to settle the historical conflict and debate over competing priorities; it simply presents them so as to encourage discussion. It does however, attempt to capture the essence of the response, providing a common focus for all segments of the response and stakeholder communities. If the model is accurate, then every major player and stakeholder should see his/her primary interest prominently represented in the row of arrows along the upper portion of the diagram. The model has the potential to enable all players and stakeholders to agree on the major functional activities with explicit acknowledgement that all interests are valued and important. As a result, the model can facilitate a more effective discussion focused on how to achieve the Best Response.

The diagram can also serve as a "shared mental model" for the entire response community. A shared model serves as a very practical alignment tool. It helps clarify the scope, complexity and interrelationships of the many important functions carried out in a crisis response. The upper portion of the graphic (the arrows) represents the major functions that must be performed effectively and efficiently to achieve Best Response. The arrows represent those major functions that directly impact the desired outcomes of the response. The use of arrows in the diagram to represent the primary functional areas was a deliberate, symbolic choice representing the fact that an effective response to a complex pollution emergency is a multi- functional event, with a wide variety of things that must be accomplished simultaneously. Each arrow is a complex, multi-organizational function that, by itself, will present significant challenges. It is incumbent on the response manager to ensure that all functions go forward simultaneously.

The lower portion, the foundation of the model, represents the response management system that must ensure that the response is carried out effectively and efficiently. That foundation is based on the National Interagency Incident Manage-

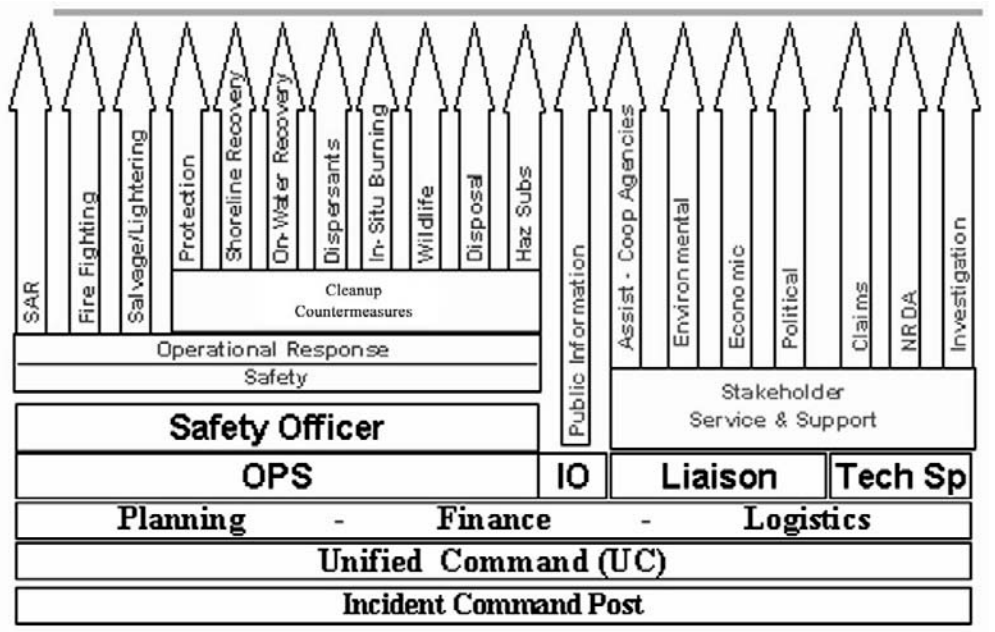


Fig. III.2. Best response (Coastal Maritime Oil Spill).

ment System (NIIMS) Incident Command System (ICS).

Operational Response

The upper left section of arrows in Figure III.1 represents the Operational Response. Typically, a major maritime pollution emergency response begins with a distress call initiating a Search and Rescue (SAR) case. That is followed quickly by mounting operational responses, as needed, in the areas of firefighting, salvage and lightering, and pollution cleanup countermeasures. Countermeasures may include containment and protection; on water recovery; shoreline recovery and clean up; wildlife protection, recovery and rehabilitation; advanced countermeasures such as dispersant application or in-situ burning; disposal, and hazardous substance response. The arrows indicate parallel, simultaneous execution of these functions.

A block labeled safety is included supporting the entire "operational" complex. Each of the operational response measures, in and of themselves, is potentially extremely dangerous. Safety must be integral to all aspects of each operation.

Public Information and Stakeholder Service and Support

Taken together, the functions of Public Information and Stakeholder Service and Support are the primary "Customer Service" functions provided by the emergency

manager. In the past, the primary customer in emergency response had been the "common good" or perhaps the "American people." Certainly these generic customers benefit from the efforts of emergency responders; however, there are far more specific customer groups with more precise needs to be served and their needs merit direct attention.

"In a Crisis, Always Be the First and Best Source of Information"—Communications Council of America.

Public Information speaks to the responsibility for keeping the public informed. It is incumbent upon on the emergency manager to keep the public fully advised so they feel confident that the response is being carried out correctly. Public confidence is important for the perceived success of the crisis response effort. It is noteworthy that a prime mover for the US Government Performance and Results Act (GPRA) was the seriously eroded public confidence in government. Large crises are one of the situations the public absolutely wants to feel confident that their government (and everyone else) is properly handling. The Public Information function carries the responsibility of ensuring that the public is fully aware of progress and has every opportunity to conclude that the incident is being handled properly. The explicit intent is that the public will have full access to the good and the bad. There is no implied intent that the emergency responders will report anything but the truth.

Stakeholder Service and Support represents the responsibility to keep all stakeholders fully advised about the status of the response. This is important because stakeholders have been impacted by the spill or have a vested interest in the outcome of the response. In an ICS organization, the Liaison Officer routinely deals with assisting and cooperating agencies, organizations or companies. In addition, there are six other categories of stakeholders that must be addressed:

General		*Specific*	
(1)	Environmental	(4)	Claimants
(2)	Economic	(5)	Natural Resource Damage Assessment Representatives
(3)	Political	(6)	Investigators

Appropriate Stakeholder Service & Support includes the idea that the response leadership actively seeks out the stakeholders, keeps them informed, and actively receives input from them. This ensures that, where possible, the management of the crisis will take into account their interests.

Public Information and Stakeholder Service and Support, taken together represent the "Customer Service" side of emergency response and are critical to the overall final judgment of the quality and the success of the response.

The Response Management System—NIIMS ICS

The next section of the model, the bottom half of the diagram, represents the Response

Management System. This diagram is arranged to provide a functional representation of how NIIMS ICS interacts and aligns with the major functions—the arrows. The Safety Officer and Operations Section work primarily in support of the Operational Response; the Information Officer (IO) is responsible for Public Information; and the Liaison Officer (LO), supported by Technical Specialists (TS), is responsible for Stakeholder Service and Support.

The supporting layer of organization is shown in the diagram as the Planning, Finance, and Logistics Sections. Their responsibilities spread throughout all areas of the functional response. Similarly, Unified Command carries responsibility for and, therefore, supports all aspects of the response.

The Incident Command Post

The bottom layer of the model—the Incident Command Post—has been placed in the diagram underpinning the entire system. This emphasizes that, in a complex pollution response, the leadership and management of the response will be facilitated by a properly equipped and configured Command Post. Integration of response resources and co-location of the principals will help improve the efficiency and the effectiveness of the response.

"Best Response" Summary

Best Response is the highly complex and challenging business of the US National Response System and emergency response in general. It is very important to understand and to be able to accomplish if we are to reach our national goal to minimize the consequences of pollution incidents to people, the environment, property and the economy.

The Best Response model clarifies and helps us focus our efforts in several ways:

- It depicts the multi-faceted activities occurring in a crisis response.
- It establishes a whole system, graphical view of what emergency response leaders need to provide.
- It adds clarity and common perspective, enabling every participant to better grasp, appreciate, and agree on the length and breadth of all that the response system is required to deliver.
- It serves as a very practical alignment tool, enabling the response community to have a "shared mental model" of the scope, complexity and interrelationships of the many important functions carried out in a crisis response.
- It is useful as a checklist for reviewing readiness.
- It is useful as a checklist for setting objectives during a response.

– It provides the ability to quickly and visually represent to the uninformed the magnitude of the challenge presented by a major pollution response and may serve as a good communication tool.

A general understanding and consensus on the Best Response model serves as the basic framework for the measurement scheme proposed in the remainder of this appendix.

Measuring the Success of a Crisis Response

Why Important?

The next challenge is to identify and to measure the actual outcomes of the response effort. The historical focus has typically been on measuring activities such as: speed in responding; feet of boom deployed; and gallons spilled and recovered rather than the actual impact of those activities. While traditional metrics are important matters in the response, they are largely reflective of processes and activities being carried out in the response and do not always directly relate to the overall outcomes. The intent is to measure outcomes that directly relate to minimizing consequences to people, the environment, property and the economy. Ideally, we want specific information that will relate to the value provided by our response efforts (i.e., through reduced consequences).

Leading vs. Lagging Indicators

There are two general categories of measurements: leading indicators and lagging indicators. Both are valuable to the manager in evaluating progress. The literature suggests that, whenever possible, a measurement plan should include both.

The Leading Indicator for emergency response must center on the response organization's capability to minimize consequences. The indicator should measure the degree of preparedness, i.e., the *apparent* ability to minimize the consequences. The Coast Guard's leading indicator will involve: (1) a detailed assessment of required response plans; and (2) an assessment of apparent capability to respond successfully in a variety of functional areas.

The capability assessment will look at such things as: resources available, systems support, policies, procedures, training levels and exercise participation. The assessments will be principally self-evaluative, but must be useful at the local, regional and national level. The leading indicator will be validated by the lagging indicator proposed below.

The Lagging Indicator will measure the actual outcomes based on the national goal. This means measuring how effective the response organization was at minimizing the consequences of a pollution incident. The primary emphasis during the past

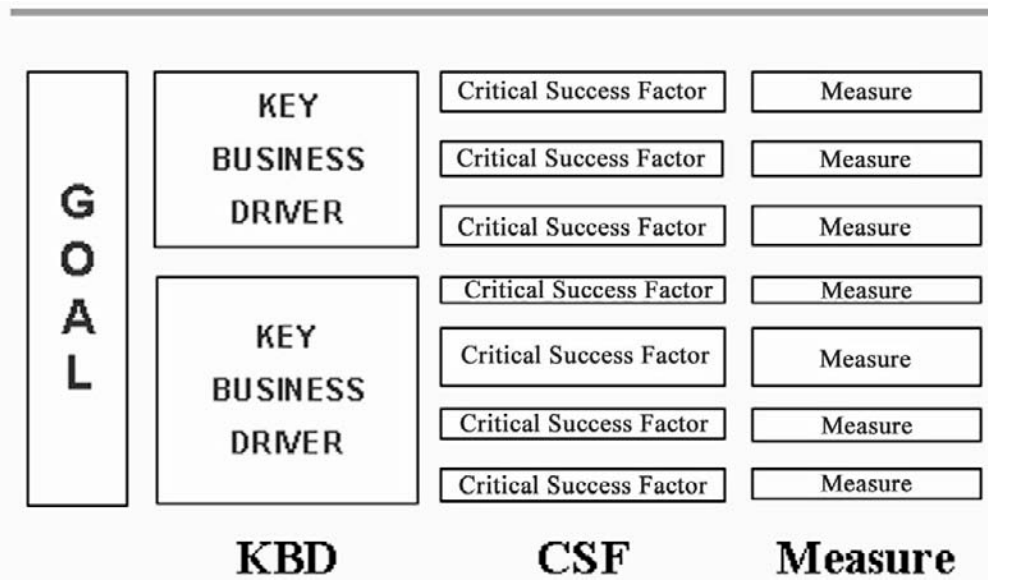


Fig. III.3. Measurement methodology.

year has been on developing a plan to measure the Lagging Indicator—the actual measure of what a response accomplishes relative to minimizing consequences. This is the focus of the rest of this appendix.

The Measurement Framework

The process used to develop measures of outcomes is depicted in Figure III.3.
Step 1: Identify the goal: "Minimize the consequences of a pollution incident".

Step 2: Identify the key business drivers (KBD) that must be accomplished in order to reach the goal: KBDs should link to those national interests (people, environment, property, economy) we are trying to benefit by minimizing the consequences of a pollution incident. The assumption is that there are several KBDs that must each be addressed to realize success. The final judgement of success will be an aggregate score based on the relative success in each of the KBDs.

Step 3: Identify the critical success factors (CSF) for each KBD: Each CSF is something that must go well or be done right in order for the KBD to be protected or receive some benefit (Rockhard, 1981). Again, the entering assumption is that there will be several CSFs that must be accomplished in order to ensure success in each KBD. The final ability to judge success in a KBD will be based on an aggregate of the success in each of the relevant CSFs.

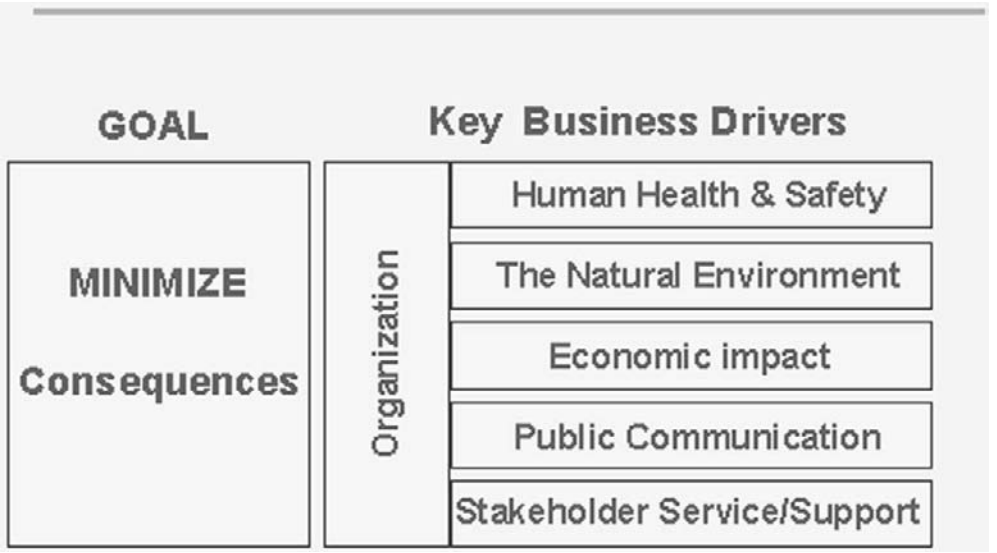


Fig. III.4. Measurement of response.

Step 4: Identify measures for the CSFs.

Identifying Key Business Drivers

Identifying the Key Business Drivers (see Figure III.4), began with a review of the research done over the past twenty years as well as extensive use of a variety of case studies and reviews by a group of experienced responders. As a result, six key business drivers were identified as critical to goal accomplishment. From the outcome measurement perspective, five of the six meet the "outcome" test in that they deal directly with the consequences of the event that we are attempting to address.

The sixth KBD, "Response Organization," is a process outcome that is essential to achieving our desired goal. Because organization figures so prominently in a successful response, it was included as a key business driver. Ideally, the response organization will become so automatic to the responders that eventually it would not even be an issue during a response. Currently, however, our Incident Command System model (or any other crisis management organizational model) is a very challenging and critical aspect of successful response.

The Key Business Drivers (see Figure III.4) are:

Operational Outcomes:

- Human Health and Safety: Injury, illness and death to responders and the general public are minimized.
- Natural Environment: Damage to the natural environment is minimized.
- Economic Impact: Damage to property and the economy is minimized.

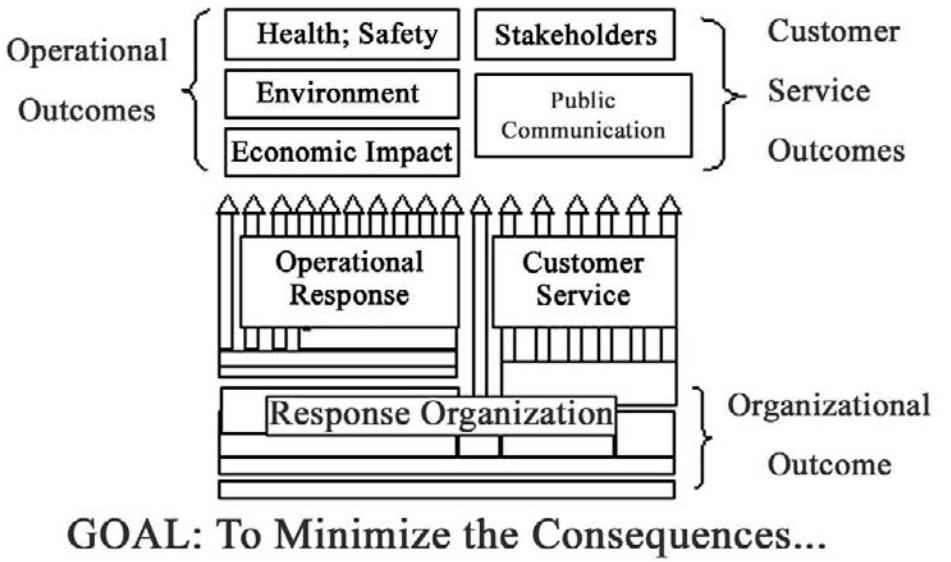


Fig. III.5. "Best response" vs. key business drivers.

Customer Service Outcomes:

- Public Communication: The public and the media perceive the response as successful.
- Stakeholder Service and Support: All stakeholders perceive the response as successful.

Organizational Outcome:

- The Response Organization: The response organization effectively and efficiently responds to the incident.

Figure III.5 depicts the relationship between the major response management functions (shown as arrows) and the key business drivers.

Identifying Critical Success Factors (CSFs)

CSFs for pollution response were identified by Harrald (1994) and consolidated by Walker, et al. (1994). The Coast Guard measurement work group struggled with how those factors might be measured. They were particularly concerned that the methodology chosen would clearly show whether or not desired outcomes had been reached. The intent was to create an evaluation tool that would challenge the response organization to meet high standards, with the accompanying assurance that, by meeting those standards, we could confidently predict success—success being defined as accom-

plishing our goal to minimize the consequences of an incident to people, environment, property and the economy.

Given the intent to build a measurement/evaluation tool, and the clear necessity for the CSFs to focus on outcomes and align with the Key Business Drivers (KBDs), the CSFs identified in the earlier works mentioned above were extensively reviewed, revised and reworked based upon the following factors:

- Participant's experience
- ICS implementation experience
- Incident Specific Pollution Reports (ISPRs)
- Lessons learned database
- Job task analysis
- Response management job aids

As the list of CSFs was completed and the work began to center on building measures for each CSF, the group concluded that a survey instrument to measure CSF accomplishment was the most practical first step. It was felt that a survey could be used to establish expectations for response and to capture the qualitative assessments of those directly involved in the incident, either as responders or stakeholders.

The Survey

In building the survey instrument, each CSF was transformed into the form of a statement describing in positive terms the accomplishment of the aspect of the response addressed by the CSF. Because the questions are based on CSFs, the expectation is that doing a good job on the CSF will directly impact accomplishment of the KBD and, in turn, success in accomplishing the goal of minimizing consequences. The survey questions created were grouped according to the six KBDs.

Survey Details

The survey is designed to use the judgment of those closest to the event to measure success and judge how well the response organization has done in each KBD. Therefore, only those individuals with good knowledge of or involvement with the response will be asked to fill out KBD surveys. A minimum number of responders and those affected by the incident will be targeted. Each person completing the survey will be asked to fill out a demographics page and then one or more of the appropriate KBD surveys depending on their involvement in the incident. Each Key Business Driver survey is on average 1 page or less. The methodology of the survey is that the person completing the survey is asked to read each "CSF" statement, and then conclude his/her level of agreement or disagreement that the statement reflects performance in the response being evaluated. A scale of from 1 to 7 affords the respondent choices ranging from "strongly agree" to "strongly disagree".

The target population of spills to be measured is tentatively set at 10,000 gallons and over (about 35 per year in the US). A detailed survey protocol—who should complete it, how many, who decides, etc.—is under development. The survey data will be collected by the US Coast Guard National Strike Force Coordination Center (NSFCC), Elizabeth City, NC using standard survey practices. The data will be used in two ways:

- *NRS Feedback*: The survey data will also be analyzed, looking for potential areas to provide feedback to the response community for improvements, either regionally or nationally.
- *Government Performance and Results Act*: GPRA requires outcome-based measures of effectiveness to substantiate the value (and thus, continued funding) of a program. The survey data will show that response organizations throughout the US are meeting consensus-based national success measures, i.e., the CSFs in the survey.

The survey is not presented here due to space limitations but is available to interested parties from the NSFCC.

As survey results are obtained, they will be reviewed and analyzed for qualitative and quantitative relationships. Such findings are expected to evolve and change with the growing body of survey data. It is anticipated that the response community will be able to develop norms and factors for assessment of a response's success. We may see such norms differentiated by geographical locale, type or volume of spill or other parameters assisting us in better coming to terms with the concept of "Best Response".

Survey Benefits

The assessment of regional and national performance trends based on post-incident surveys will evolve as surveys are conducted. This may take several years. Nevertheless, the survey, with its embedded KBD framework and specific CSFs will immediately serve three very important needs:

(1) As an alignment tool before the response;

The survey serves as an alignment tool before the response. Such a tool develops a "shared mental model" clarifying expectations for all players. Such a common understanding of goals, methods, roles and procedures can substantially contribute to improving the effectiveness and efficiency of operations. People that understand and buy into the desired outcomes are more likely to work creatively to achieve them with less direction from management.

(2) As a guide—i.e., a "Balanced Resonse Scorecard"—during the response; and

Using the survey parameters as a guide or checklist during the response is also very helpful. There are a variety of factors that impact on success in any undertaking. The

prudent manager, especially in the complex realm of emergency response, should make it their business to identify those factors and establish a means to monitor progress in meeting them as the enterprise unfolds. This should include details about progress in the key business driver areas, in addition to the traditional operational details. The complete array of information that the response manager needs may be considered a Balanced Response Scorecard and should include the following:

Operational Details

Incident Status—*"What's the problem?"* and *"What are we doing about it?"*

A. Situation status—describes incident and area of impact
B. Resource status—describes people and equipment assignments
C. Financial status—describes sources and uses of funds

Key Business Driver Details:

Key Business Driver Survey—*"Will we reach our desired outcomes?"*

A. Operational Outcomes:
    1. Human Health & Safety Impact
    2. Natural Environmental Impact
    3. Economic Impact
B. Customer Service Outcomes:
    4. Public & Media Communication
    5. Stakeholder Service and Support
C. Organizational Outcome:
    1. Response Organization Status

(1) Finally, as a consistent, post-response, self-evaluation tool.

The KBD survey, with its CSFs provides a consistent, simplified method for evaluating the hundreds of smaller incidents that will not be formally surveyed. The response manager can be assured that all key success areas are being reviewed and may use the format to determine lessons learned or best practices from the response.

Summary

We began with a simplified, whole system view of the National Response System, identifying the players, the business and the goal. We described the NRS as a partnership of the public and private sectors. Each entity works to deliver Best Response in order to meet our goal of minimizing consequences.

We then discussed a measurement plan designed around our goal to minimize consequences and identified six key business drivers. Each business driver had a series of critical success factors proposed as details in a survey. This format enabled

the measurement of a complex pollution response through qualitative assessments by responders or stakeholders.

Provided we can obtain consensus—in itself not a simple task—and validate the tools used, this measurement model will be a key performance improvement element for crisis response. It takes a major step towards setting performance expectations by describing what a successful response looks like. It will also provide for more consistent evaluations that will be useful at the local, regional and national levels.

Beyond the benefits of the formal measurement model, we suggested that the survey, with its embedded KBD framework and specific CSFs could serve three other very important needs:

- As an *alignment tool* before the response;
- As a *guide or Balanced Response Scorecard* during the response; and
- As a consistent, post response, *self-evaluation tool* for those hundreds of incidents that will not be formally surveyed.

The proposed Balanced Response Scorecard blends the traditional operational detail focus with an awareness of progress towards desired outcomes (by reference to the KBD survey). The authors encourage this broader crisis management perspective. Establishing it as our expectation holds great potential to help our entire response system get a better focus on what the country really wants and needs from a crisis response.

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Table of Recent Civil/Criminal Decisions

Date	Case name/docket	Civil/criminal damage/penalties
2/7/90 (Incident)	*American* Trader case, Golob's 12/12/97	$12.8m compensatory dmges, $5.3m fine, $21m clean-up costs
2/21/93 (Incident)	*US v. Palm Beach Cruises*, (S.D. Fla.) (8/30/94)	$500k fine, ECP mandated
90–98 (Incidents)	*Command*, Liberian tanker and its operator, Amax, Mystery spill, OSIR 10/7/99	$9.4m Crim'l, civil, Capt. Banned from U.S. ports 3 yrs/ Amax on probation
92–97 (Incidents)	*Koch Petroleum Group*—refinery, criminal carelessness/ drainage of fuel into lake, OSIR 10/7/99	$8m in penalties, $6m crim'l, $2m to improve polluted park
93–96 (Incidents)	*BP Exploration* (Alaska), illegal injection of hazardous waste, OSIR 2/10/2000	$22m in fines & penalties, 3 yr probation, 1 yr jail for employee
1993 (Incidents)	*US v. Ocean Chemical Carriers* (M.D. Fla., No. 97-148-CR-T-17-E) (6/12/98)	Capt.—$15k fine, 3 yrs. Probation, 24 mos. Suspended license; CO—$240k fines & Restitution, 2 yrs probation, ECP, oil into Int'l waters
94–95 (Incidents)	*Royal Caribbean Cruise Lines*, oil and toxic chemical dumps along Alaskan sea routes, OSIR 1/27/2000	$3.5m settlement
94–97 various (Incidents)	*Royal Caribbean Cruise Lines*, plea bargain—dumping oil and hazardous waste at sea, OSIR 7/22/99	$18m, 21 felonies—of which $6m for envir'tal projects—guilty of "fleetwide conspiracy"
8/9/93 (Incident)	*US v. Cross Med. Maritime* (S.D. Calif.) (9/13/94)	$10k fine, repayment to USCG $56k for cleanup costs, $40k purchase skimmer for USCG for clean-up

Oil Spills First Principles: Prevention and Best Response. Edited by B.E. Ornitz and M.A. Champ
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Date	Case name/docket	Civil/criminal damage/penalties
1/7/94 (Incident)	*US v. Pedro Rivera* (D.PR, Crim. No. 95-84 9HL)) *Bunker Group Puerto Rico, Bunker Group Inc., New England Marine Services*	$75m fine, 5 yrs CO. probation, seizure $19.5m assets, 1 yr. Prison Mg'g agent (rev'd), licenses surrendered for master and mate
10/94 (Incident)	*Pacific & Arctic Railway & Navig. Co.* Case, Golob's 12/12/97	Pres't—9 mos imprisonment, $10k fine; Mgr—12 mos. Confinement, $5k fine; CO-$1.5m fines & restitution
10/25/94 (Incident)	*US v. Royal Caribbean Cruises*, (D.PR, Crim. No. 96-333(PG)), S.D. Fla., Crim No. 98-103-CR-Middlebrooks	$8m fine in PR, $1m fine in Fla., 5 yrs probation, mandatory Environmental Compliance Program
3/26/95 (Incident)	Varlack Ventures, Inc. M/V *Venture Pride*, St. John, VI—oil from bilge pumped into water (U.S. D. VI)	$50,000 fine, 3 yrs. Probation, $300,000 to upgrade & maintain vessels. Capt Fredericks guilty of failure to notify NRC.
5/10/95, 5/12/95 (Sentencing)	*US v. Crescent Ship Services* (E.D. La.)	Pres't—8 mos. Confinement, 3 yrs superv'd release. Mgr. & Port Capt.—6 mos detention, $3k fine, Capt. - 6 mos detention, $3k fine, CO—$250k fine, ECP, 5 yrs. Probation
12/2/95 (Jury conviction)	*US v. M/G Transport Services* (S.D. Ohio)	20 yrs oily waste discharge, CO., capt. & Port Eng'r convicted
1/5/96 (Sentence)	*US v. HBM River Plant, Inc.* (M.D. La.)	CO—$224k fine, $2m cleanup, CEO—12 mos. Imprisonment
1/19/96 (Incident)	*US v. Eklof Marine Corp* (No. 97-075 (D.R.I); No. P2-97-3244-A (RI Super Ct.)	Plea Agt., COs $7m Fines, $1.5m purchase of land; $1m Eklof to upgrade safety, $20m cleanup costs, Pres't Eklof—$100k fine, 3 yrs probation; Master—$10k fine, 2 yrs. Probation, license revoc.
1/30/96 (Indictment)	*US v. Apex Oil Company, Inc.* (D.Or. No. 95-CR-332)	$250,000 fine, Port Capt 3 yrs probation, 6 mos home detention, $3000 fine, ECP—Ocean Dumping Act
2/15/96 (Incident)	*Sea Empress*, Milford Haven, UK, OSIR 3/23/2000	Port Authority criminal fine of $8m reduced to $1.18m
11/19/96 (Incident)	Bahamian-flag bulker *Elm* and cargo ship *Atlantic Carrier*, (Newfoundland, Canada), Golob's 12/12/97	Charges vs. COs, master, Ship's Officers 8 counts—possible $1m Canada fine per charge
1/3/97 (Incident)	*Knutsen Shipping* case (Grimsby Magistrates' Court, UK)	35k pound fine (1 pound = $1.68)

Date	Case name/docket	Civil/criminal damage/penalties
4/97 (Incident)	Klyne Tugs Ltd. tugboat *Anglian* Duke U.K Spill , Golob's 10/2/98	35k pound fine (1 pound = $1.70)
6/97 (Judgment)	Republic of Korea tanker, *Osung No 3* grounding & spill (IOPC Funds 1998)	Korean Criminal Court sent'd master to 1 yr. Prison
8/24/97 (Incident)	Dutch/UK ship *Resolution Bay*, North Sea spill case, Golob's 7/10/98	$15k pound fine (1 pound = $1.64)
10/15/97 (Incident)	Cypriot tanker—*Evoikos*, Thai Tanker—Orapin Global Case, Strait of Singapore, OSIR, 7/1/98	Capt of Evoikos—$35k fine & 3 mos. Jail; Capt. Of Orapin—$6,500 fine & 2 mos. jail
10/21/97 (Settlement)	*Colonial Pipeline Co*., Golob's 10/31/97	$1.5m up to 2.5m criminal, to restore area
2/8/1998 (Incident)	Malaysian container ship *Brandenburg*, OSIR 5/6/99—oil in shipping lane	$24,154 criminal fine, guilty plea
3/24/98 (Incident)	Norwegian tanker *Havrim* case, Golob's 4/10/98	20k pound fine, slick off Scotland's Flannan Islands
3/29/98 (Incident)	*Nordholt*—illegal dumping in shipping lane, 11 mile slick, OSIR 1/6/2000	$27,265 fine, one of largest Canadian fines
5/98 (Conviction)	Doyon Drilling, Inc., Anchorage Alaska, Golob's 5/22/98	CO—$1m fine, 5 yrs probation, $2m for ECP; Environmental Co'r—1yr, 1 day jail, $25k fine; Sup'r- 4mos home confinement, 5 yrs probation, $25k fine
6/19/98 (Plea Agt.)	*US v. Holland America Lines* (D. Alaska, No. A-98-0108-CR)	CO—$1m fine, $1m restitution, 5 yrs probation, ECP
7/22/98 (Incident)	Danish container ship *Weser* off Lands End, UK, Golob's 9/18/98	250k pound fine (1 pound = $1.68)
8/19/98 (Incident)	Malaysian coal freighter, *Pernas Amang*—ballast discharge, OSIR 7/1/99	Magistrate fine—$13,174
8/19/98 (Plea Agt.)	*US v. Intracoastal Liquid Mud* (W.D. La., No. 98-CR-60024)	6 yrs violations of discharge, CO—$500k fines, 5 yrs. Probation, ECP mandatory, 3 ees facing criminal chges charges
9/27/98 (Incident)	*Command*—spill of 3,000 gallons bunker fuel, without reporting	$2.5m, criminal plea bargain & civil damages—Total of $9.4m
3/1/2000 (Sentence)	*Koch Petroleum Group*—Discharge of oil into wetland and Minnesota waterway, OSIR 3/9/2000	$6m—$2m remediation into park system

Date	Case name/docket	Civil/criminal damage/penalties
1/20/99 (Incident)	Petrobas Oil Refinery—343,000 gallons spill Rio de Brazil, OSIR, 1/27/2000	$28.7m fine.
2/2000 (Incidents over 10 years discovered)	*Delaware State's Delmarva Power & Light Co*., discharges of 600,000 gals. Into Indian River, OSIR, 6/9/2000	$350,000 penalty fine, NRDA fines open, cleanup costs up to $1.2m.
3/29/2000 (Sentence)	*Arthur Kill, NJ*. Spill of 49,000 gal, merchant seamen sentence, OSIR, 4/6/2000	Imprisonment, 1 year and 1 day, fine $2,000, loss of license
5/2000 (Sentence)	*Nissos Amorgos* Venezuelan vessel spill in Maracaibo channel, OSIR, 7/20/2000	Master sentenced to 16 months in prison
7/16/2000 (Third incident)	*Petrobas Oil Refinery*—1.06m. Gals. Crude into Iguacu River, Brazil, OSIR, 8/3/2000	$94m. Fine, payable over 3 years. Potential cancellation of license. Subject of an appeal
12/12/99 (Incident)	*Erika*, Maltese-flagged tanker, broke in two in Bay of Biscay, France, carrying 8.8m. Gals, OSIR, 8/24/2000	Master, Karun Mathur, jailed by French authorities, other damages/sentences pending Charges against 2 French Naval officers and senior official of marine prefecture pending, OSIR, 6/15/2000

Appendix V

Review of the Processes and Factors for Estimating Time Windows for In-situ Burning of Spilled Oil at Sea

Atle B. Nordvik[1], Michael A. Champ[2] and Kenneth R. Bitting[3]

Abstract. This appendix discusses processes and factors for estimating time period windows of in-situ burning of spilled oil at sea. Time periods of in-situ burning of Alaska North Slope (ANS) crude oil are estimated using available data. Three crucial steps are identified. The first step is to determine the time it takes for the evaporative loss to reach the known or established limitation for evaporation and compare this time period with estimated time of ignition at the ambient wind and sea temperatures. The second step is to determine the water uptake of the spilled oil and compare it with the known or established limitation for water-in-oil content. The third step is to determine the necessary heat load from the igniter to bring the surface temperature of the spilled oil to its flash point temperature so that it will burn at the estimated time of ignition of the slick.

Keywords: In-situ burning, oil spills, processes, factors, time periods, windows-of-opportunity, igniters, gelled gasoline, heat load.

Introduction

Historical Perspective

In-situ burning of oil is defined as the "controlled" burning of spilled oil either on water, or wetlands and marshes, in which the direct burning of the oil is a more effective process for removing oil from the aquatic environment than other available technologies. Initially the interest in in-situ burning came from the experience of some of the early large accidental oil spills in which the oil that contaminated shorelines caused extensive environmental damage and resulted in very high clean-up costs.

An example of early success with in-situ burning during the *Exxon Valdez* clean-up was when 15,000 to 30,000 gallons of the spilled oil was held in a fire boom and

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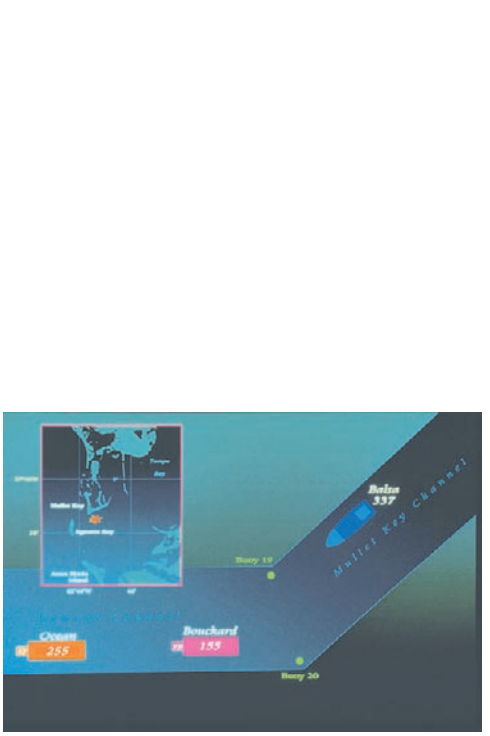
burned in about 75 minutes with an estimated 98% efficiency leaving about 300 gallons of a stiff, taffy-like burn residue that could be picked up easily upon completion of the burn (Allen, 1990).

In August 1993, a large-scale open ocean burn was conducted 42 km (25 nmi) east of the port of St. John's, Newfoundland. This in-situ burn project was commonly called the Newfoundland Oil Burn Experiment (NOBE). This field trial and demonstration project was conducted with the participation of some 35 agencies from Canada and the US with sponsors from government, the oil industry and private institutions as led by Environment Canada. The projects objectives were to: (1) obtain critical data and information on burn parameters and to collect and analyze chemical emissions needed for comparison with data sets and models that are currently based on laboratory and medium-scale tests; (2) obtain samples for analysis of the smoke plume, water, and gaseous emissions needed to determine whether the environmental impact of burning is acceptable; (3) gain experience from conducting a large-scale oil burning experiment in realistic open ocean conditions to demonstrate contained burning as a spill response technique; and (4) develop a response protocol that will establish operational strategies for burning and safety procedures under a variety of environmental and operational conditions (Fingas et al., 1994). Findings were that they were able to burn spilled oil in two tests at rates between 600 and 900 liters a minute with >99% efficiency. Some compounds in the oil of concern were detected up to 150 meters downwind. Only particulate matter/soot was a concern near the burn area and of no concern 500 meters downwind. Results of aquatic toxicity testing were too low to be measured. PAHs were found to be lower in the soot than in the starting oil and were consumed by the fire to a large degree (Fingas, 1995a, b).

Subsequently, LaBelle et al. (1994) suggested that the 1993 oil spill (*Bouchard B-155*) off Tampa Bay merited consideration for in-situ burning. Ross et al. (1995) in an unpublished MSRC report suggested that in-situ burning could be more effective than mechanical clean-up in removing oil from water. Additional benefits were the speed of the process and the minimization of waste recovered. Concern for air pollution and human health risks was the major concern.

McCourt et al. (2000) tested seventeen crude oils over a 5-year period in laboratory and controlled burns as candidates for in-situ burning. They have published a table of their results and found that, in general, oils with an API gravity of less than 20 will burn only under optimum conditions and that oils with an API gravity of greater than 35 should burn easily.

In addition, a feasibility study was conducted by Yoshioka et al. (1999) to assess if some of the past-historical oil spills (141 spills) could have been a candidate for in-situ burning using a set of criteria that they developed to make the assessment: (1) oil weathering; (2) response logistics; (3) weather; and (4) distance to populated areas. Each spill was reviewed on the basis of the established criteria and assigned a pass or fail rating. They then used a second process in which those that met the above first phase criteria were then subjected to a second phase of more critical more site-









On 10 August 1993, three ships collided in Tampa Bay, Florida: the *Bouchard B155* barge (on fire), the freighter *Balsa 37*, and the barge *Ocean 255*. The *Bouchard B155* spilled and estimated 336,000 gallons of No. 6 fuel oil into Tampa Bay. The barge *Ocean 255* after the collision is the 4th photograph. Photographs courtesy of NOAA Office of Response and Restoration.

specific data and information. Their final results identified that 10% (14 out of 141) of the historical oil spills that they reviewed were good candidates for in-situ burning.

PCCI (1999) conducted an assessment funded by the USCG to delineate the natural conditions affecting the success on in-situ burning of spilled oil using three criteria: (1) time from spill to ignition (oil evaporation and dispersion); (2) degree of emulsification as a limiting factor (water uptake); and (3) conditions that affect

operations (weather). This report focused on API gravity and grouped oils and recommended that heavy crude oils (i.e., Mundulay, Merey, No. 6 fuel oil, Bunker C which range from 17 to 10 API gravity) were good candidates for in-situ burning.

In the US today, about 1/3 of the recent in-situ burning of accidentally spilled oil have been in Gulf Coast (Texas & Louisiana) coastal areas in estuaries and marshes where the focus has been on preventing long-term environmental damage to estuarine organisms and marsh plants by burning the oil. A comprehensive summary of the environmental effects of in-situ burning of some 30 inland and upland marsh oil spills was funded and published by the American Petroleum Institute (Dahlin et al., 1999). An example is the pipeline oil spill in Upper Copano Bay, Texas (Tunnell et al., 1995). In many of these cases, in-situ burning was used because the burning removed the oil quickly and prevented spreading into more sensitive areas or over large areas, and reduces the amount of oily waste for collection and disposal. In sites where limited access to the spill site reduces the feasibility of mechanical or manual recovery, burning would be a final measure or last resort, where mechanical recovery poses a greater threat to the environment (Dahlin et al., 1995) and where dispersants do not work (Walton, 2002, personal communication).

Open water in-situ burning experience from accidental oil spills is very limited. However, several recent large spills might have merited consideration of using in-situ burning to remove some of the spilled oil (the *Jessica* oil spill off the Galapagos and the Petrobras 36 Platform in the Roncador Field, Campos Basin) for the protection of the environment.

This appendix has been prepared to review in-situ burning and to focus on the mechanism and the process, and to identify the steps involved in using in-situ burning as an oil spill clean-up and response management tool and to work up a model example for an oil for which there are sufficient data and information to identify the time periods of the window-of-opportunity for this oil under selected environmental conditions.

In-situ Burning of Spilled Oil

The primary purpose of in-situ burning and any oil spill response operation is to protect the environment, wildlife resources, and human health and safety by removing oil quickly and effectively from the sea surface. Even though research and development within the area of in-situ burning has taken place for decades, there is still missing information for responders to fully estimate the time window-of-opportunity for utilization of in-situ burning as a clean-up method/technology in oil spill response with certain degree of accuracy.

API gravity has been used in feasibility studies to demonstrate the possibilities of success of in-situ burning. Even though API gravity has been used in the literature as a relative measure of volatility, it is not directly linked to vaporization and parameters determining ignitability. In-situ burning can be considered a viable oil spill response

method only if data on ignitability for fresh and weathered crude oils and refined products are available, and the heat load required for ignition is known, to estimate the time periods of window-of-opportunity in contingency planning and response. For in-situ burning, this requires the development of an ignitability database based upon basic physical and chemical processes of weathered oil. It is pointless to consider the use of in-situ burning as a response in circumstances where it will not be feasible, such as where the oil will not burn. Several groups of key factors determine the success of an in-situ burning operation.

The first group of factors is related to flammability and ignitability of floating oils and are tied to oil composition and molecular weight, vapor pressure, vaporization rate, flash point, boiling point, and temperature and air movements (wind).

The second group is related to the changes in oil properties due to oil weathering during the response time, defined as the time from the onset of the spill to ignition. Weathering processes that have great influence on ignitability and effectiveness of in-situ burning are evaporation and emulsification.

The third group contains operational and technical considerations, and includes the capability of the resources (vessel and booms) to contain and thicken floating oil, durability of fire resistant booms and the capabilities of the ignition source to elevate the oil surface temperature to the fire point temperatures where burnable vapor–air mixtures can be developed.

Results from measurements of oil surface temperatures during experimental burns, coupled with dynamic flash point and evaporation data, are useful for estimation of ignitability. Current igniters are limited in their ability to produce or influence the volatilization rate of oils required to sustain burning. This limitation in current technologies may be a major reason why ignition of many weathered oils have failed, and not necessarily the weathering process itself (Walavalkar and Kulkarni, 2000). Use of in-situ burning requires knowledge and understanding of the basic processes that limit and lead to the formation of ignitable vapor–air mixtures, and how changes in oil composition will affect ignition and sustained burning.

Development of Flammable Vapor

The first group of factors is related to the chemical and physical properties of oil, in particular, factors related to flammability and ignitability. The vapor from a flammable liquid and the ease of ignition, as well as the rate of burning, is dependent upon the inter-related properties such as *vapor pressure*, *vaporization rate*, *boiling point*, and *flash point* (NFPA, 1997).

Vapor Pressure and Boiling Point

The vapor pressure is determined by the kinetic energy of molecules, and is a measure

of a liquid volatility or ability to vaporize. If the liquid is in a closed container, the molecules are confined in the vapor space, and a point of equilibrium is reached when the rate of escape of molecules equals the rate of their return to the liquid. The pressure exerted by the vapor at the point of equilibrium is called the *vapor pressure*. A high vapor pressure is usually an indicator of a volatile liquid, or one that readily vaporizes and forms ignitable vapor. The pressure is often referred to as Reid Vapor Pressure (RVP). For example, for gasoline it can vary from 7.0 psi (summer) to 15.0 psi (winter), which is a result of special additives to meet governmental regulations and efficiency of combustion.

In the open air, a liquid will boil when its vapor pressure equals atmospheric pressure, and the corresponding temperature is known as *the boiling point*. When the temperature reaches the boiling point, the average kinetic energy of the liquid is sufficient to overcome the forces of attraction that hold molecules in the liquid state. A high boiling point indicates low vapor pressure and volatility at ambient temperature. Therefore, an oil's boiling point depends on its vapor pressure, which is a function of molecular weight, chemical structure and temperature.

Formation of Flammable Vapor and Vapor–Air Specific Gravity

Vapor–air specific gravity is the ratio of the weight of a vapor-in-air mixture (resulting from the vaporization of a liquid at equilibrium temperature and pressure) to the weight of an equal amount of air under the same conditions. The specific gravity (density) of a vapor–air mixture thus depends upon the ambient temperature, the vapor pressure of the liquid at the ambient temperature, and the molecular weight of the liquid (the molecular weight of a compound is the sum of the atomic weights of all atoms in its molecule). Low molecular weight oil components have higher vapor pressure, and *lower boiling points*, than higher molecular weight components of similar oils.

If an oil's temperature is well below its boiling point, the vapor pressure may be so low that the vapor–air mixture, consisting mostly of air, has a density that approximates that of pure air (vapor–air specific gravity near 1). As the temperature of the oil increases to the boiling point, the rate of vaporization increases, the vapor displaces the surrounding air, and the vapor–air mixture specific gravity approaches that of the pure vapor specific gravity. A vapor–air mixture with a density significantly above that of air will be heavier and sink (seek lower levels). The density of a vapor–air mixture is therefore often used to evaluate the potential for flame spreading.

Combustion and Ignition—Flash Point and Fire Point Temperatures

Combustion of oil is a self-sustaining reaction involving oxidation of fuel vapor by atmospheric oxygen, in which combustion takes place in the region where vapor and oxygen is mixing just above the oil surface.

Ignition of oil is the process by which self-sustaining combustion may occur if the heat flux is great enough to raise the oil to its flash point. To ignite spilled oil, thermal energy (heat) may be supplied in the vicinity of the surface to convert a sufficient part of the oil to vapor that can be mixed with air to a flammable vapor–air mixture. The minimum oil temperature that is capable of generating a flammable vapor–air mixture is called the *flash point*. The flash point of a liquid corresponds roughly with the lowest temperature at which the vapor pressure is just sufficient to produce a flammable mixture (vapor and air) at the lower limit of flammability. The flash point depends on the proportion of low molecular weight components, and is the most commonly used parameter for evaluation of flammability.

To develop a sustained burn, the temperature of the oil has to be elevated to its *fire point*, where the *vaporization rate* is sufficient to create flammable vapor–air mixtures. The fire point may be defined as the lowest temperature of the liquid at which vapor evolves fast enough to support sustained burning. The fire point is usually a few degrees above the flash point. For typical fuels, the minimum rate of vaporization required to support combustion is of the order of 2 g/m^2 (NFPA, 1997).

The Limits of Flammability

Ignitable vapor–air mixtures occur when the concentration of vapor in air is within two defined limiting percentages, commonly referred to as the flammable range. Within the limits of flammability, combustion of the vapor concentration will continue to propagate at the specific temperature and pressure. The limits of flammability are referred to as the lower (lean) limit (LFL) and the upper (rich) flammability limit (UFL). Below the lower flammability limit, the temperature, and vaporization rate is insufficient to form flammable vapor–air mixtures. There is also a maximum temperature above which the fuel concentration is too high to propagate flame. For in-situ burning this limit is unlikely to occur. Figure V.1 on the next page illustrates the limits of flammability and the lower and upper flash point temperatures.

The term LFL describes the minimum concentration of vapor to air below which propagation of a flame will not occur in the presence of an ignition source. When a liquid is present in a closed container with an atmosphere of vapor–air mixture above the surface, the percentage of vapor in the mixture may be determined from the vapor pressure. The percentage of oil vapor is directly proportional to the relationship between the vapor pressure of the liquid and the total pressure of the vapor–air mixture (at normal atmospheric pressure). If the vapor pressure at the flash point temperature is known, the lower flammable limit for the vapor in percent by volume at normal atmospheric pressure can be calculated.

Vapor pressure data at flash point temperatures are useful for evaluation of ignitability of floating oils. However, measurement of vapor pressure at flash point temperatures are usually not part of standard oil weathering monitoring procedures for the assessment of ignitability of floating oil.

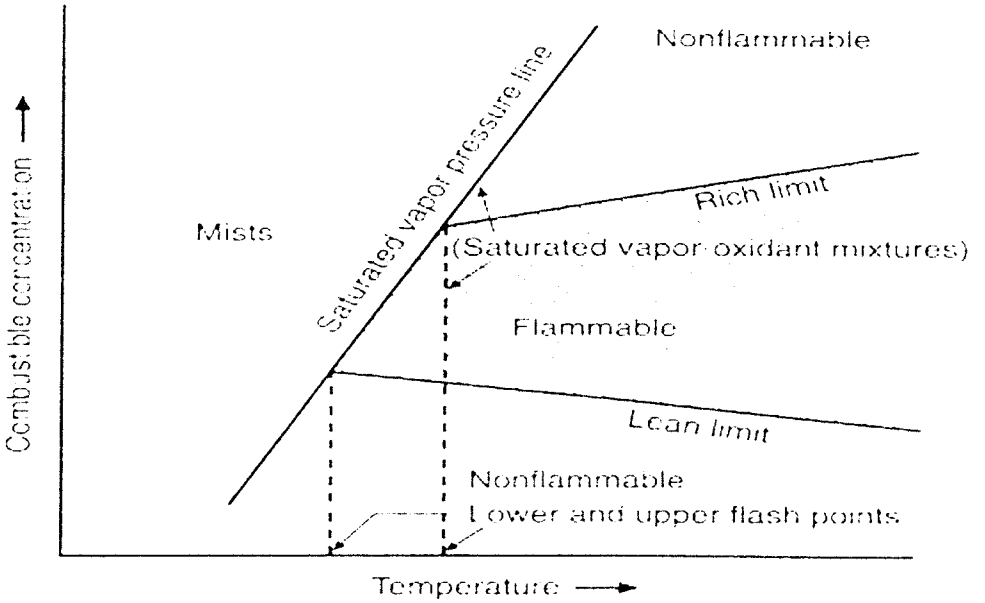


Fig. V.1. A plot presenting the limits of flammability and lower and upper flash point temperatures.

Temperature Range and Flammability of Floating Oils

Spilled oil will rapidly transfer heat until it reaches the surface seawater temperature, which can vary between −1 and 28 °C in US coastal waters, depending on location and time of the year. The difference between oil temperature and oil flash point temperature (where the vaporization rate is just sufficient to create flammable vapor–air mixtures) is the temperature increase and is related to the quantity of energy required by the ignition device to develop flammable vapor–air mixtures. Oils with flash points below the ambient sea temperature can easily be ignited and have much faster rates of flame propagation, than oils with flash points above ambient sea temperature. Oils with flash points above ambient sea temperature need to be heated to form flammable vapor–air mixtures before the flame will spread through the vapor.

Radiation, Elevation of Oil Surface Temperature and Heat Sink vs. Oil Thickness

Once the oil has been ignited, radiant heat will elevate the temperature of the oil that is adjacent to the heat source, and bring the remaining oil at the surface to above its fire point temperature. Even though, only approximately 3% of the heat from a burning oil slick is radiated back to the surface, the oil surface temperature may increase to several hundred degrees centigrade (Ross et al., 1995). Results from experimental burn tests

with unemulsified Statfjord crude oil at 3 °C sea surface temperature, with thickness 5, 10, 20 and 30 mm, resulted in oil surface temperatures of approximately 150, 200, 325 and 450 °C respectively (Guénette et al., 1994). Prior evaporation of spilled oil does not diminish the potential for in-situ burning, as long as the temperature of the surface of the oil can be elevated to above the oils flash point temperature. If flash point temperatures are below the temperatures created from a fully developed burn by radiation, for example 200 °C, then sustainable burning can occur, if not then the oil may not be ignitable.

Oil thickness is important to insulate the oil slick from heat loss to the seawater below it. Studies have concluded that the oil thickness necessary to provide insulation between oil and water surface for fresh crude and light refined products is 1–3 mm, for diesel oil 3–5 mm, and for Bunker C/Fuel oil No. 6 and emulsified oils are 5–10 mm (Buist, 1999; Ross et al., 1995). The thickness of the floating oil is also critical to reduce heat loss to the surface of the sea, which can cool the oil below the flash point temperature and terminate flammability.

The increased heat loss from the surface of the oil is caused by reduced insulation from the water droplets in the oil, resulting in reduced oil surface temperature during burning.

As mentioned, oil surface temperatures, measured during experimental burns for fresh oils range from 150 to 450 °C (dependent on oil thickness). However, Ross et al. (1995) found that for emulsions, they only ranged between 100 and 250 °C. This indicates that emulsified oil with a flash point above the 250 °C will not receive sufficient heat radiation during burning to keep the surface of the oil above its flash point temperature.

Figure V.2 presents an illustration of a cross-section of an in-situ burning emulsified oil.

Refined Oils and Their Ranges of Flash Points

With refined products, the ranges of flash points are known and are used to separate out the product. This information can be used to estimate the potential for burning, because the surface temperatures of burning oils has been established. Refining is the process of separating the many groups of compounds present in crude oils. During refining, the crude is heated and changed into gases in a distillation tower. When a compound in a gaseous state cools below its boiling point, it condenses into liquid, and is drawn off the tower. The various groups of oils from the distillation tower is further processed and blended to provide commercial products to fit standard specifications such as flash point, viscosity, sulfur content and density/API gravity. Figure V.3 illustrates the distillation process, groups of refined gases and oils with boiling point ranges and c-values (Ophardt, from
http://www.elmhurst.edu/ chm/onlcourse/chm110/outlines/distill.html).

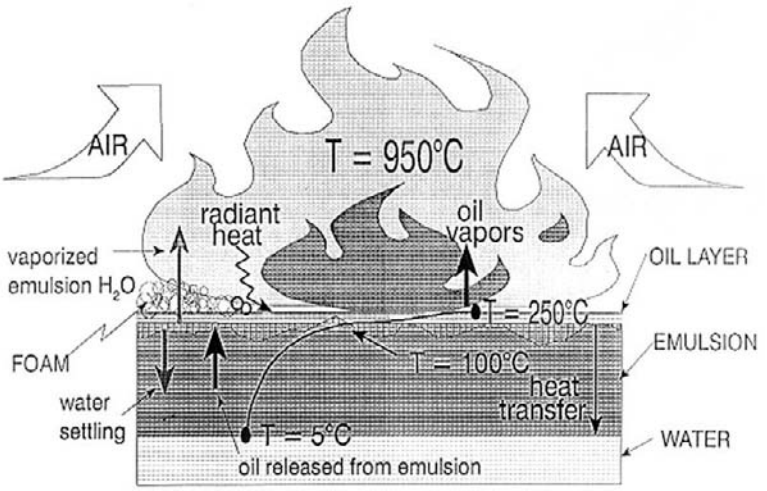


Fig. V.2. Diagram of the cross-section of in-situ burning of an emulsion to demonstrate heat transfer and burning.

Refined products are divided in two classes as flammable and combustible with defined flash point ranges. Class I flammable liquids are defined as those fluids with flash point below 37.8 °C and vapor pressure below 40 psi. Class I liquids are sub-divided and Class IA includes liquids with flash points below 22.8 °C (73 °F) and a boiling point below 37.8 °C (100 °F). Class IB includes those having flash points below 73 °F (22.8 °C) and boiling point at or above 100 °F (37.8 °C). Class IC includes liquids with flash points at or above 73 °F (22.8 °C) and below 37.8 °C (100 °F).

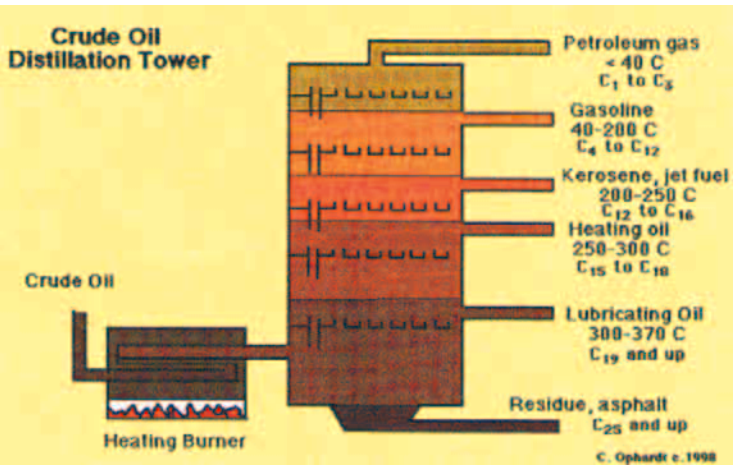


Fig. V.3. Illustration of the distillation process with groups of refined products, boiling point range and c-values (number of carbon atoms).

Combustible liquids are those with flash point at or above 37.8 °C, and are subdivided in Class II, with flash point between 37.8 °C (100 °F) and below 60 °C (140 °F), and Class IIIA with flash points between 60 °C (140 °F) and 93.4 °C (200 °F).

The highly flammable and combustible products in Class I, includes gasoline and liquid gases such as propane and butane. These products spread and evaporate very quickly and represent great fire and safety risks, and are therefore not included as products for in-situ burning. Refined product spills that could be considered for in-situ burning includes the combustible products in Group II, with flash point temperature range from 37.8 to 93.4 °C (73 to 200 °F).

Weathering of Oil

Weathering of oil influences ignitability, sustained burning, and effectiveness of in-situ burning and represents the second group of key factors. Until the studies of Wu et al. (1998), the influence of weathering and the formation of oil/water emulsions on flash and fire points had not been studied. The major weathering processes include evaporation, water-in-oil emulsification, spreading, and dispersion (oil-in-water emulsion). All of these four processes are very incident (oil spill) and oil specific, and occur progressively as oil weathers at rates, that depend on the oil composition and ambient environmental conditions. Dispersion is not a factor related to ignitability of floating oil, but is used in combination with evaporation and emulsification in mass balance calculations to estimate amounts of oil remaining on the sea surface.

Weathering effects are different for crude oils and refined products due to the differences in low molecular weight compounds, evaporation rates, flash point temperature ranges, and compounds determining the emulsification process. In order to estimate ignitability, it is important to differentiate between:

- Continuous release (fresh);
- Evaporated spilled oils (non-continuous); and
- Evaporated and emulsified oils.

Continuous release spills (fresh) will most likely keep the in-situ burning window-of-opportunity open due to the short weathering exposure before ignition. Evaporated spilled oils (non-continuous) are most likely ignitable up to 2–5 days after a spill, while evaporated and emulsified oils are difficult to ignite with current ignition technologies within 1–2 days.

Evaporation and Increase in Flash Point

The rate of evaporation of an oil slick and the volume of oil lost are dependent on

Table V.1.
Presentation of boiling point and flash point ranges for indicated refined fuels

Light refinery oils	Boiling point range (°C)	Flash point range (°C)
Gasoline	30–180	<40
Diesel	149–312	37.8–60
Kerosene	151–301	37.8–70

the vapor pressure of the oil, ambient air and sea temperature, wind, water content of any emulsion, and thickness of the oil film. The important result of evaporation is that the remaining oil at the sea surface changes the physical-chemical characteristics by increasing the flash point, boiling point, viscosity and density.

In general, most components of spilled oil with boiling points lower than 200 °C (up to C12) will evaporate within 12–24 hours, while components with boiling points up to 270 °C (less than C16) will disappear from the spill within several days. Light refinery products such as gasoline, diesel and kerosene will evaporate after some hours or a few days on the sea surface. Evaporation is defined as a percentage of volume lost. See Table V.1.

Studies of ignitability in experimental test burns have suggested that approximately 30% evaporation is the upper range for ignition of emulsions (Buist, 1999). However, because evaporation is not related to a specific flash point temperature, we suggest that it is not an appropriate measure to estimate ignitability of emulsified oils. A point of contention is that an oil can reach its flash point, but in high winds will not ignite because of the dilution of vapors. But flash point is the most appropriate measure of ignitability and will determine if an oil will burn.

The flash point temperature for various fresh crude oils are in the range of −40 to +30 °C, and increases rapidly in the first hours after being spilled. Figure V.4 presents a plot of flash point data versus time for six selected crude oils at wind velocity 5 m/s and sea temperature 15 °C. The flash point temperatures of the oils presented in Figure V.4 will increase after the first 24 hours by approximately 25–30 °C within the next 2–5 days (Strøm-Kristiansen et al., 1993).

Even though the flash point temperature for the evaporated oils still after 5 days may be ignitable, the emulsification process may prevent or make ignition difficult (see below).

Emulsification

The emulsification process makes ignition and burning of oils more difficult. The water content in emulsified oil:

- Reduces vaporization of ignitable gases;

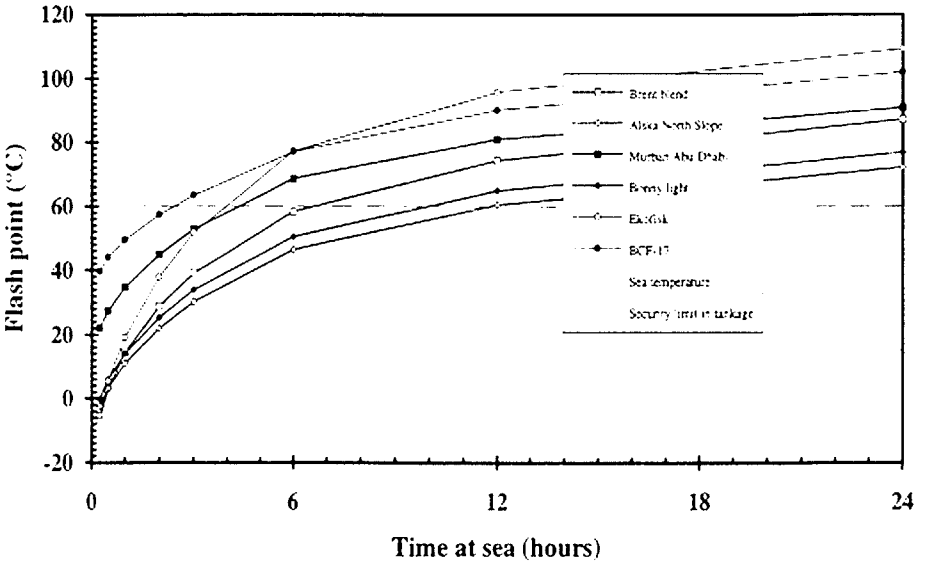


Fig. V.4. Increase in the flash point temperature within the first 24 hours at sea for six selected crude oils at wind velocity 5 m/s and sea temperature 15 °C.

- Reduces the rate of evaporation and combustible concentration of gases;
- Reduces flame temperature;
- Reduces burn rate and burn efficiency; and
- Increases the heat loss, oil viscosity and emulsion stability.

The burn efficiency depends on the water content in the oil, emulsion stability, and the flash point of the oil at various degrees of evaporation. The emulsification process is initiated at wind velocities above 2–3 m/s and may result in water-in-oil content between 20 and 70% within 6–12 hours after a spill, depending upon wind velocity and oil composition. Figure V.5 illustrates the emulsification process over time.

An emulsion is generally unstable in the early period of a spill and becomes more stable with evaporation and increased viscosity (Fingas et al., 1998). Important compounds in oils that determine water-in-oil emulsification and emulsion stability are resins, waxes and asphaltenes, and some suspended particles in the ocean. The term stability is used to define an emulsions capability to maintain water content. When the water droplet size in emulsified oils have reached a sufficiently small size so that the forces of gravity cannot naturally separate them, the emulsion is termed stable. Figure V.6 is a microscopic view of water droplet size in an emulsion after 1 and 24 hours.

The emulsification process is reversible and crude oil emulsions can be broken by radiant heat and/or chemically by demulsifiers (emulsion breakers). Laboratory testing has indicated that some stable crude oil emulsions, within 2–5 days after a spill, dehydrate when the emulsion temperature is elevated to approximately 50 °C.

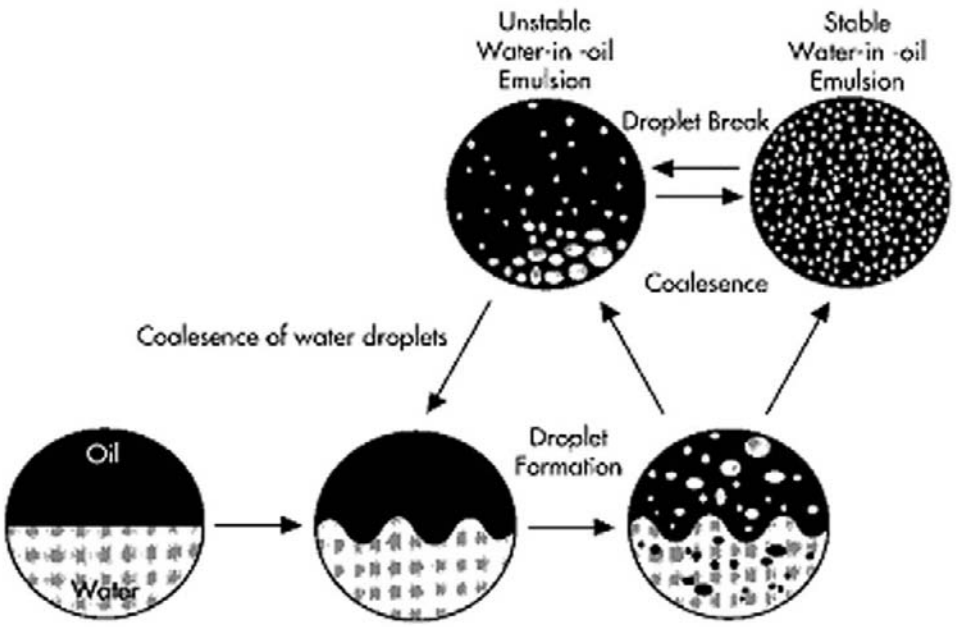


Fig. V.5. Illustration of the formation of an emulsion as a spilled oil weathers into a stable water-in-oil emulsion, which can incorporate up to 70–80% water in oil over time (Lee, 1999).

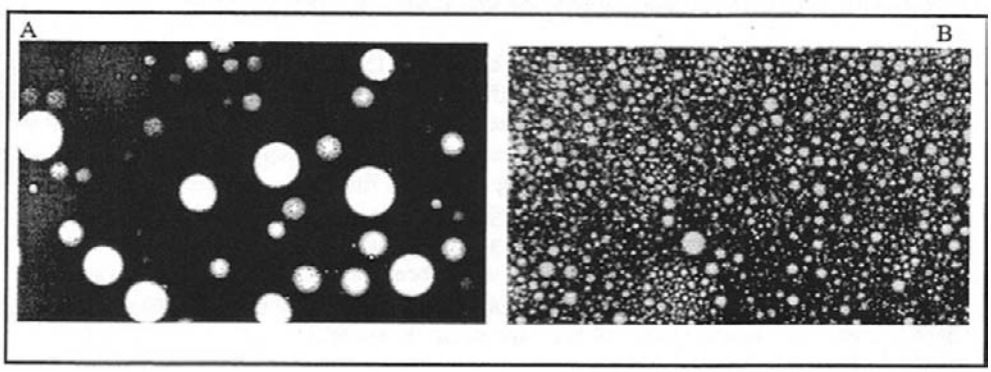


Fig. V.6. Microscopic view of water droplet size in an unstable emulsion after 1 hour at sea (left), and after 24 hours following stabilization (right) of the same oil (Strøm-Kristiansen et al., 1993).

Lighter refined products like gasoline, jet kerosene, diesel, and heating oils do not emulsify to any degree that affect ignition and in-situ burning. Heavier fuel oils emulsify to approximately 40–50% or 60% water content in very windy conditions and less during calmer conditions (Strøm-Kristiansen at al., 1994).

In-situ burning of emulsions develops vapor and steam at the surface (generally with no combustible content) when the temperature of the oil emulsion approaches

the boiling point of water. Water vapor or steam absorbs radiant heat from the igniter or burning oil. The water vapor or steam and smoke generated may therefore reduce the heating of the oil surface and make ignition and sustained burning of emulsions difficult, and in particular, for oils with flash points above 100 °C.

Ignition of emulsions with higher stability, viscosity, limited insulation and lower oil surface temperature, require higher radiant heat load igniters and extended ignition time to increase oil temperature to its flash point and flame temperature to expedite burning.

Stable emulsions are more difficult to ignite than medium and low stability emulsions. A microscope view of a stable emulsion indicates that approximately 70% of the oil surface area is covered by water droplets, surrounded by a thin oil film, that limits the vaporization of ignitable vapor. The limit of ignitability and sustained burning of oils that have formed various degrees of stable emulsions needs to be determined by quantitative and qualitative tests using standardized test methods.

Even though data are not now available to predict, with a high degree of accuracy, the exact time window-of-opportunity (±60 minutes) for in-situ ignition and burning, windows have been estimated by using correlating data. Such data indicate that stable emulsions are difficult to ignite with more than 25% water, while unstable crude oil emulsions with 60% water content can sometimes be easily ignited (Guénette et al., 1994).

Water Removal Processes During Burning

The processes of reducing the water content from oils of various degrees of emulsification (stability) are different (Guénette at al., 1994; Strøm-Kristiansen at al., 1994). For unstable emulsions, the water drains off the oil by gravity separation, while water in stable emulsions form steam at the surface, reducing the flame temperature and radiant heat.

Operational and Technical Considerations

The third group of factors includes the capability of the resources (vessel and booms) to contain floating oil in various wind and sea states, the durability of fire resistant booms and the capabilities of the ignition source to elevate the temperature of the surface of the oil to the flame point temperature where ignitable vapor can be developed.

It has been observed that wind speed and direction can have a positive effect on flame spreading. However, excessive wind can make ignition and sustained burning difficult, and waves can prevent ignition of marginally ignitable oils and stable emulsions by creating thinner oil layers at the top of the crest and by speeding up the rate of emulsification.

Operational Considerations

Listed below are the major advantages and disadvantages presented in the ASTM standard guide for in-situ burning (ASTM F1788-97).

Advantages of in-situ burning include the following:

- Rapid removal of oil from the water surface;
- Requirement of less equipment and labor than many other techniques;
- Minimal storage and disposal requirement for the recovered burn residue;
- Significant removal of volatile emission components; and
- May be the only solution possible, such as in oil-in-ice situations?

Disadvantages of in-situ burning include the following:

- Creation of a smoke plume;
- Residues of the burn must be dealt with;
- Time in which to ignite the oil may be limited;
- Oil must be a minimum thickness to burn, which may require containment; and
- The fire may spread to other combustible materials.

The valid arguments for considering in-situ burning as a response measure are that it extends the options for response by decreasing the dependency on recovered oil and water storage and disposal needs and costs. The latter remains a limiting factor for large catastrophic spills at sea. From an operational point of view, major concerns have been related to the likelihood of conducting a successful in-situ burning operation. Factors of concern are:

- Response in a timely manner to meet the window-of-opportunity;
- Difficulties associated with igniting emulsified oil slicks;
- Relies of heavy smoke and soot;
- Distance of burning oil to populated areas (smoke and secondary fires);
- The fate of unburned residue; and
- Thermal durability and seaworthiness of fire resistant booms.

Even though ignition of weathered and emulsified oil may be difficult, application of ignition and combustion promoters, such as diesel or other liquids with lower flash points than the spilled oil, may extend or open the time window. The emulsification process can be reversed by the use of heat and/or emulsion breakers (Strøm-Kristiansen et al., 1995). A promising "break and burn" technique utilizing emulsion breakers and heat has been successfully demonstrated during tank and field tests in Canada (Buist et al., 1996), Spitsbergen (Guénette et al., 1994) and the UK (Thornborough et al., 1997). However, break and burn application technologies (spray guns and mixers) to extend the time window from vessels are not currently available for practical operations.

Igniters and Missing Specifications

Many different ignition devices have been tested over the last several decades without providing responders with information required for evaluation of ignitability. Igniter heat loads and burning time limitations are factors that have resulted in many failures to ignite an oil slick. Evaporated and emulsified oils require longer ignition time and higher heat loads than fresh and less weathered oils. Methods to improve ignition devices to extend the time window for in-situ burning have successfully included mixing of gelled fuel and emulsion breakers to rapidly remove water by gravity settling, resulting in reduced formation of steam during ignition and burning. However, key data that are not available for evaluation of igniters include: *heat loads* (*heat production*), *heat flux* (ΔT °C) *created on the surface of the oil*, *oil surface area heated*, and *data on oil temperature increase* to evaluate if the igniter is capable of closing the gap between the sea temperature and flame point temperature.

Fire Resistant Booms

Unconfined slick spreading will rapidly result in oil layers of less than 1 mm, and the minimum oil thickness for ignition has been found to be 1–3 mm (Buist, 1999). This is also the thickness when a flame starts to extinguish due to heat loss to the underlying water. Floating oil, therefore, needs to be contained in fire resistant oil booms prior to ignition and burning and oil depths maintained at greater than 3 mm. A boom towing aspect of the burn operation is not significantly different from conventional oil containment booms; fire resistant booms have the same towing speed, oil loss, and sea state limitations. Oil thickness measured in regular containment booms during experimental oil spills in the North Sea varies from 50 to 600 mm, and should therefore provide sufficient insulation to ignite and burn oil.

Testing of fire resistant booms in recent years clearly indicate that most of the current refractory fabric-based fire resistant booms are not capable of withstanding high temperatures (up to 2000 °F) in waves, and wave conformance is limited and less than that for regular booms. In the past, the lack of fire resistant booms has been a limiting factor in the success of in-situ burning. However today, the newly developed water-cooled booms have been found to meet new ASTM requirements for testing fire resistant booms (Bitting, 1999). The photograph below is from the Newfoundland Offshore Burn Experiment (NOBE) [August, 1993] illustrating a controlled in-situ burn of experimental spilled oil in offshore open ocean waters. For more information on the NOBE Burn experiment see the following overview citations (Fingas, et al., 1994, 1995) and the following Environment Canada Website:
http://www.etcentre.org/main/e/pubs/biennial/birep1996.html#16.2



Photograph from the NOBE Burn Experiment (August, 1993). Courtesy of Joe Smith of Ross Environmental, Seattle, Washington, and Environment Canada.

Effect of Wind

Wind velocities in excess of 20 knots make ignition of spilled oil difficult for three reasons: (1) the vapor–air mixture is rapidly diluted below flammable concentrations; (2) the flame from the ignition source may extinguish; and (3) the wind effect cools the oil surface temperature below the oils flash point temperature. Figure V.7 illustrates the tow speed and wind velocity values where in-situ burn operation is likely.

Modeling Tools to Predict Ignitability and Sustained Burning

Crude oil weathering, or the changes in oil properties and behavior caused by different prevailing conditions, has been extensively studied in recent years. A combination of standardized, "step-wise" laboratory investigations, combined with verified (field studies) numerical modeling, has enabled the models to be calibrated to improve the accuracy of predictions in changes in flash point, evaporation, boiling point and emulsification for many different oil types (Strøm-Kristiansen et al., 1993). Models are not perfect and need further refinement, but today, they provide useful information to estimate windows-of-opportunity. These predictions have been used to assess the applic-

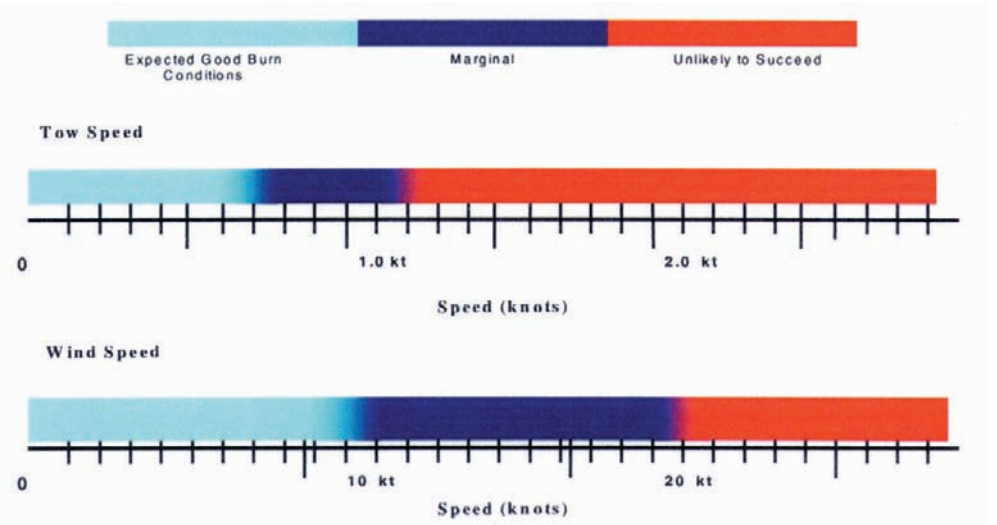


Fig. V.7. Tow speed and wind velocity values where in-situ burn operation is likely (PCCI, 1999).

ability of response techniques such as dispersants as a "time window-of-opportunity" for dispersant use (Lewis and Aurand, 1997).

Models to predict time windows-of-opportunity for in-situ burning are not currently available because standardized test methods for ignitability of emulsions, or ignition devices capability to raise oil surface temperature to flash point temperatures, are not available. In this appendix, however, flash point, evaporation, and emulsion data available in IKU Oil Weathering Model, have been used to indicate the potential of ignitability of floating oils (Daling et al., 1997). But without linkage to ignition source data on expected increase of oil temperature, the data are of limited value to predict feasibility of in-situ burning.

The Principles of Burning Oil Slicks at Sea

Although the general principles and limitations of in-situ burning are well known, the possibilities and limitations of in-situ burning and estimation of the "time window-of-opportunity" are incident and oil specific (Strøm-Kristiansen, 1993). The feasibility of in-situ burning can only be realistically assessed if the influences of oil composition, prevailing conditions and capabilities of the ignition source to elevate oil temperature to its flash point temperature are known.

All mineral oils, even the heaviest, will burn if the circumstances are correct for ignition and sustained burning (Strøm-Kristiansen, 1993). However, previous in-situ burn studies have indicated that a thin film of crude oil from which almost all of the most volatile and flammable components have evaporated, and which has incorporated water to form a water-in-oil emulsion, cannot be set alight very easily, if at all,

while it is on the sea. However, results from emulsion breaking studies have indicated that elevation of surface temperature to approximately 50 °C is sufficient to break many crude oil emulsions. For Bunker C oil, research has found that the combination of emulsion breakers and heat is required to break them (Strøm-Kristiansen, 1994).

Experimental spills have demonstrated that fresh or relatively unweathered crude oil can easily be ignited and that they can burn well leaving only a very small amount of residue. It is also known that spilled oil, in general, becomes difficult or impossible to ignite when the oil:

- Layer thickness drops below a critical minimum (>2–3 mm);
- Has lost a substantial proportion of its more volatile and flammable components by evaporation; and
- Has formed an emulsion by incorporating water.

Ignition of Highly Flammable Liquids

When oil with a flash point below seawater temperature is spilled on the sea, the most volatile components will evaporate rapidly at rates that depend on the vapor pressure of the spilled oil, slick thickness and the prevailing temperature (sea and air) and wind speed. The vapor will ignite if an ignition source (accidental or intentional) is present and the flammable vapor concentration exceeds the minimum vapor–air concentration. The flammable vapor concentration in the air is being constantly diluted by the effect of the wind. The minimum concentration of flammable vapor that is required for ignition will therefore persist for a period of time and depend on several factors such as:

- The proportion of readily volatile and flammable components originally present in the oil (broadly the fraction that boils below 150 °C—the gasoline fraction).
- The thickness of the oil slick and the way that this decreases during spreading (or increases due to subsequent containment).
- The rate at which the flammable components are being transferred into the vapor phase (the mass flux, which depends on the proportion of molecular weight oil components, temperature and wind speed).
- The rate at which the flammable vapor concentration in air is being diluted to below the minimum flammable concentration by the wind.

If a low energy ignition source, such as a spark or open flame is introduced into the vapor at this stage, ignition of the vapor–air mixture will occur. The flames will radiate heat, which will rapidly evaporate more flammable vapor from the oil, and the burn will become self-sustaining. The fire will burn until almost all the oil has been consumed.

Many crude oils contain a sufficiently high proportion of the volatile components to produce the flammable vapor at prevailing ambient temperatures. Fresh crude oils have been successfully ignited even at thickness as low as 0.8 mm.

Ignition Leading to Self-Sustained Burning

When the flash point of the spilled oil is above the seawater temperature, the spilled oil needs to be heated to its flash point temperature. During the rapid evaporation phase, the volatile and flammable components (the gasoline fraction) will evaporate from the crude oil and dispersed to below the minimum flammable concentration without burning. The risk of accidental ignition by a low energy ignition source will have passed.

Less readily volatile components of the crude oil (those with boiling points higher than 150° C—the kerosene fraction and higher) can be easily and rapidly evaporated by the application of moderate amounts of heat from an ignition source such as a flaming rag. When these components have been evaporated in sufficient local concentration, ignition from the same source that provided the heat will be possible. Localized burning of the freshly liberated vapor will then occur and this will, in some circumstances, be sufficient to generate more flammable vapor which will subsequently ignite, and lead to sustained burning.

Ignition Not Followed by Sustained Burning

If the oil does not contain a high enough proportion of readily volatile components, or is present in too thin a layer to be able to provide a sufficiently high flammable vapor concentration locally, the flammable vapor may briefly ignite, but rapidly extinguish.

Technologies to increase the heat energy (i.e., the amount and duration of heat radiated onto the oil slick) of the ignition source by using more igniter fuel or bigger and more persistent igniters (such as the Helitorch) may be able to generate sufficient local vapor concentration for ignition. However, if the oil layer is too thin and the heat loss to great to produce sufficient vapor, the ignition will be transient or unsuccessful.

Failure to Ignite

It has been found that some thin films of lightly weathered oils and even thick layers of emulsified oils are impossible to ignite, even when high energy, long duration ignition sources are used.

This can occur with thin oil layers, where the heat radiated from the ignition source passes through the oil and is absorbed by the underlying water. Subsequently the oil absorbs only a small proportion of the heat, and the increase in temperature is not sufficient to elevate the oil temperature to its flash point.

Thick layers of emulsion (containing up to 70% volume of water) may also cause failures to ignite, because the radiant heat from the igniter is consumed by evaporating the water. The water vapor (non-flammable) released from the emulsion result in the dilution of the concentration of burnable vapor–air mixture.

Considerations for Conducting In-situ Burning

The following considerations are a summary of the limitations and requirements for in-situ burning, and have been established based on a number of experimental spills and laboratory investigations:

A. *Minimum slick thickness*
   - 1–3 mm for fresh crude oils.
   - 3–5 mm for diesel and weathered crude oil.
   - 5–10 mm for Bunker C and emulsified oil.

B. *Oil weathering*
   - Evaporative losses of appropriately 30% (except for highly refined products).
   - Combination of evaporation and emulsification with water content of less than 25–50%, depending on emulsion stability and ignition source.

C. *Weather conditions*
   - Wind velocity of less than 10–12 m/s.
   - Waves of less than 1 m for non-emulsified oils, and less for emulsions.
   - Current speeds of less than 0.5 m/s.

Although all of these factors are known to influence ignitability, they represent relative trends without specific time windows estimates needed for contingency planning and decision-making processes. An absolute assessment of ignitability can only be made once a suitable method to measure ignitability has been devised.

Estimation of Time Windows

The time window is defined as the period where response methods and technologies are most effective in oil spill response. The estimation of time windows is a highly integrated process, where the selection of response technologies is more efficient, technically correct, cost effective, environmentally sensitive and appropriate. The estimation of time windows integrates environmental, dynamic oil weathering and performance effectiveness data for oil spill response technologies derived from laboratory, mesoscale, and experimental field studies.

The objectives behind the development of time windows are to:

- Increase the effectiveness of selected clean-up technologies by using them in the correct time windows;
- Increase the cost effectiveness and efficiency of the response;
- Reduce the environmental impact of spilled oil;
- Prepare a scientific foundation for the response decision-making process; and
- Direct researchers and technology manufacturers in their effort to improve response community knowledge, technologies, and clean-up capabilities.

To properly estimate the window for ignitability, the following must be known:

- The type of oil that has been spilled;
- The oil and seawater surface temperature at the time of ignition;
- Data for wind, sea state, currents, etc.;
- The required increase in oil surface temperature determined for ignition; and
- Expected increase of oil surface temperature during sustained burning, are the most important factors/parameters to assess ignitability.

The failure to determine the heat flux (ΔT °C) of igniters by research over the past decade has severely limited the ability to use them in a wide range of in-situ burning options. For example, an igniter that only has the capability (which is currently unknown) to provide a heat flux to the oil/water surface of 50 °C is ineffective when 100 °C is needed. However, because the data on heat flux are not available, use of igniters today is by trial and error.

ANS In-situ Burning Windows—A Model Example

To demonstrate the method to estimate windows, data for this example have been selected as an example, and the input data may not represent the total range of limits for this specific oil. As more data and understanding are available, these estimates for windows can be refined.

To demonstrate an estimation of time periods of in-situ burning, given the combined effect of evaporation and emulsification, the following scenario with mid-scale testing have been prepared (Buist, 1999):

- Spilled oil is Alaskan North Slope (ANS);
- Sea temperature 5 °C;
- Wind velocities 10 and 5 m/; and
- Ignitability up to approximately 20.4% evaporation and 25% water content (60% with emulsion breaker).

The ignitability data used in this scenario are also for ANS crude oil and comes from laboratory, meso, and field experimental burns (Guénette, 1994). The above oil and conditions have been selected because of available data.

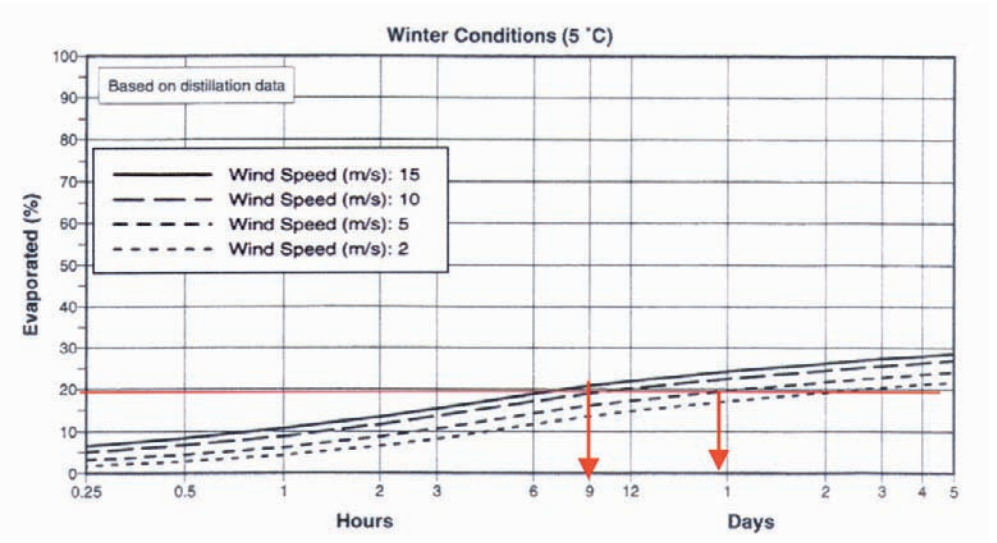


Fig. V.8. A dynamic plot of evaporative loss for ANS over time at indicated wind speeds.

The *First Step* is to estimate the time available, before evaporation exceeds the estimated time period for ignition for the spilled oil and compare this time with the needed time for response.

Figure V.8 illustrates a dynamic plot of evaporative loss of ANS crude oil at 15, 10, 5, and 2 m/s wind velocity predicted by the IKU Oil Weathering Model (Strøm-Kristiansen, 1993) using available laboratory data (Buist, 1999). The time it takes for the spilled oil to reach the point where evaporative loss exceeds ignition (20.4%) with current ignition technologies, is indicated in Figure V.8 by red arrows for 10 and 5 m/s wind velocities and is approximately 9 and 22 hours respectively.

The *Second Step* is to determine the water uptake of the spilled oil. Without the use of an emulsion breaker, the maximum water content in the emulsion was 25% for ignition and burning (Buist, 1999), marked in blue in Figure V.9. Results from laboratory and field testing has shown that an emulsion of ANS can be ignited and burned with 60% water content (marked in red) by using an emulsion breaker in combination with gelled gasoline.

Figure V.9 presents a dynamic plot of changes in water content at four wind velocities with marked horizontal lines for 25 and 60% water content. The time it takes to reach 25% water content at 10 and 5 m/s wind velocities are up to 4 and 12 hours respectively. For emulsion with 60% water content, the burn time increases to approximately 22 and 70 hours by using the break and burn method marked in red. However, the evaporative loss limits the ignition at maximum 22 hours (see Figure V.8). The “break and burn” method, therefore, increased the time window for the 60% water-in-oil emulsion from 4 to 22 hours, and from 12 to 22 hours at 10 and 5 m/s wind velocity respectively.

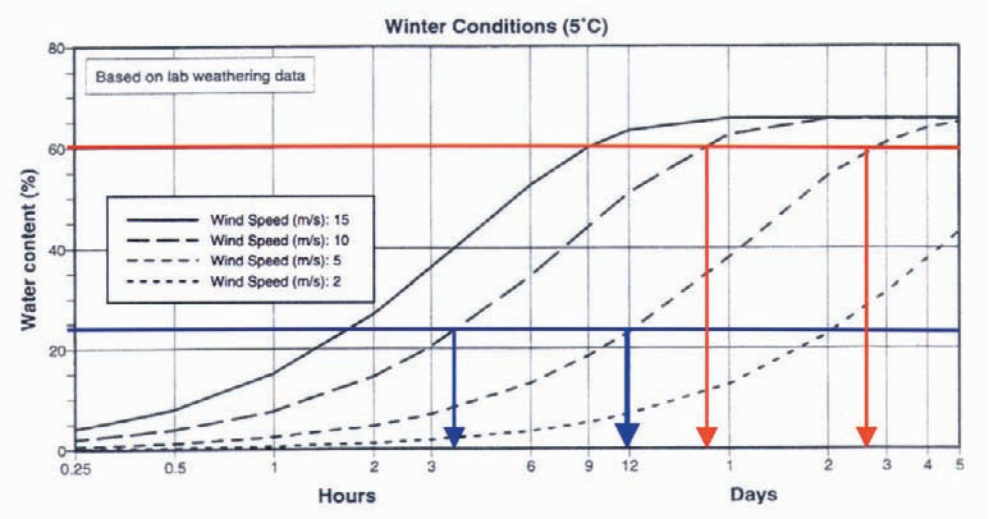


Fig. V.9. A dynamic plot of changes in water content (%) for four wind velocities (15, 10, 5, and 3 m/s) for indicated time periods.

The *Third Step* is to determine if the heat flux (ΔT °C) from the igniter and ignition method is sufficient to bring the surface temperature of the spilled oil to its flash point temperature so that the oil will burn. This means that the sea and flash point temperatures of the 20.4% evaporated spilled oil must be known.

In the example below, it is known from field test results that the use of gelled gasoline ignited and burned the 20.4% evaporated and 25 and 60% emulsified ANS crude oil at 5 °C sea temperature (Guénette, 1994). Because the evaporative loss corresponds to its flash point temperature at 20.4% evaporation, the flash point can be found by comparing the oil weathering models" predicted flash point at 9 and 22 hours at wind velocities of 10 and 5 m/s respectively (Figure V.8).

Figure V.10 presents a dynamic plot of changes in flash point during oil weathering for ANS crude oil. The sea temperature (marked in blue) and the estimated flash point temperature at 20.4% evaporation (marked in red) are plotted in the figure and show that the flash point at ignition was approximately 58 °C. Even though the heat flux at ignition is unknown, the minimum increase of oil surface temperature of 53 °C (58 °C flash point minus 5 °C sea temperature) was exceeded.

Discussion of Caveats

In this review and model example, we have attempted to bridge the gap between available data and information from open water in-situ burning experiments and the technical literature from laboratory and field mesoscale studies, and we are aware

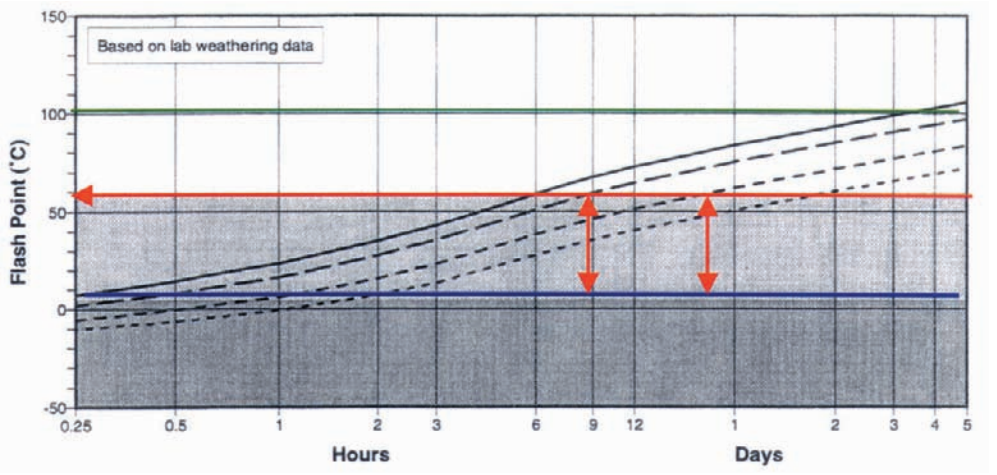


Fig. V.10. A dynamic plot of changes in ANS crude oil flash point temperatures at various wind velocities (15, 10, 5 and 2 m/s) for indicated time periods (9 and 22 hours) where in-situ burning was successful.

that the estimate time periods (windows-of-opportunity) in this appendix are based on limited research and flash point data, and that the ability to burn an oil is a complicated combination of factors as we have discussed.

It should be noted that the burning limitations for ANS is an example of the method to estimate time windows, and that the evaporated loss with its corresponding flash point temperature may not represents the actual limitation of ignition. The main reasons is because data points above 20.4% evaporation are limited, test methods for experimental burns are different, the effectiveness of chemicals (demulsifiers) varies, and the method of ignition does not provide net heat flux (ΔT °C), and corresponding data of temperature increase capabilities.

It appears, however, that the success of in-situ burning is dependent upon the successful ignition of a slick. In the future, the heat flux (ΔT °C) of commercial igniters should be determined and calibrated to provide ignitability capability data. Higher heat flux igniters capable of increasing the oil surface temperature to temperatures measured during experimental burns of evaporated oils (150–450 °C—dependent on oil thickness), and for evaporated and emulsified oils (100–250 °C), clearly indicate the potential to extend the time window.

Summary

Three Steps have been identified to estimate the in-situ time period windows-of-opportunity:

Step 1. The *First Step* is to determine the time it takes for the evaporative loss to reach the known or established limitation for evaporation and compare this time period with estimated time of ignition at the ambient wind and sea temperature.
Step 2. The *Second Step* is to determine the water uptake of the spilled oil.
Step 3. The *Third Step* is to determine the necessary heat load from the igniter to bring the surface temperature of the spilled oil to its flash point temperature so that it will burn.

This flash point of the emulsified spilled oil must be known (as also the evaporation rate and the water content) and the ability of the igniter to produce enough heat flux to bring the surface of the oil to the temperature where sustained burning will occur.

If the oil spill planners and responders do not have the specific data discussed above, and resources (booms and igniters), they may be unable to estimate and utilize time windows of in-situ burning to maximize the effective response to an oil spill. The estimation and use of time windows is consistent with the regulations of OPA 90.

Readers interested in more information on in-situ burning of spilled oil need to study the references cited below. The authors of this appendix will continue to explore management strategies for ISB of spilled oil, as opportunities and funding become available, to support the utilization of the windows-of-opportunity strategy in oil spill response to reduce clean-up costs and environmental damage.

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Appendix VI

Spill Information Resources Contacts

Spill Information Sources & Contacts:

Major offices & who to contact for information related to:
Spill Response & Clean-up Industry,
International (IMO) etc.,
Government,
Academia,
Shipping Associations,
Scientific Associations,
Classification Societies, and
Protection & Indemnity Clubs, Insurance Companies.

Spill Response & Industry Contacts

RESPONSE ORGANIZATIONS

Australian Marine Oil Spill Centre
PO Box 305
North Shore, Vic 3214
Tel: +61 3 5272 1555
Fax: +61 3 5272 1839
E-mail: dblackmore@amosc.com.au
Website: http://www.aip.com.au/amosc

International Oil Spill Conference—
American Petroleum Institute (Exhibitor and Attendee Lists)
ICF Inc, 7th Floor
9300 Lee Highway
Fairfax, VA 22031-1207
Tel: 301-468-3210/800-960-2242
Fax: 301-468-3662
E-mail: osp@tainc.com

Oil Spills First Principles: Prevention and Best Response. Edited by B.E. Ornitz and M.A. Champ
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Website: http://www.iosc.org
Website for API: http://www.api.org

The International Oil Spill Resource and Information Center
FlemingCo Environmental: Lists companies in the oil spill industry
Website: http://www.oil-spill-web.com

Net Resources international Ltd., Unit 23
The Coda Centre
189 Munster Road
London, SW 6 6AW, UK
Tel: 44 171 385 0611
Fax: 44 171 385 0622
Internet: http://www.offshore-technology.com
Links to : htttp://www.ship-technology.com
Provides information for ship building industry and industry organizations in response, equipment catalogues, conferences
E-mail address: dblackmore@amosc.com.au

Marine Spill Response Corp.
455 Springpark Place, Suite 200
Herndon, VA 20170-5227
Tel: 703-326-5617
Fax: 703-326-5660
Internet: http:/www.msrc.org

Marine Preservation Assoc.
8777 N. Gainey Center Drive, Suite 165
Scottsdale, Arizona 85256
Tel: 480-991-5500
Fax: 480-991-6085
E-mail: raldag@mpaz.org
President: Robert Aldag
Internet: N/A

Miller Environmental Group, Inc.
Mark Miller, President
538 Edwards Avenue
Calverton, New York 11933
Phone:631-369-4900 Ext. 211
Fax: 631-369-4909
E-mail: mmiller@millerenv.com

Website: http://www.millerenv.com

National Response Corporation
446 Edwards Avenue
Calverton, New York 11933
Phone: 631-369-8644 Ext. 203
Fax: 631-369-4908
E-mail: scandito@nrcxchange.nrcc.com
Website: http://www.nrcc.com

Other major oil spill response organizations in the US:

* Clean Sound Cooperative
  Tel: 425-744-0948
  Website: www.cleansound.com
* Clean Rivers Cooperative
  503-220-2055
* Clean Bay Inc.
  Tel: 925-685-2800
* Clean Islands
  Tel: 808-536-5814
  Website: http://www.cleansilandscouncil.com
* Clean Coastal Waters
  Tel: 562-432-1415
* Cook Inlet Spill Prevention and Response Inc.
  Tel: 907-776-5129
  Website: www.@CISPRI.org
* Alyeska Pipeline Service Company
  Tel: 907-834-6602

Some international oil spill response organizations:

* Oil Spill Response Ltd
  Tel: 44 1703 33 1551
* Clean Caribbean Cooperative
  Tel: 954-983-9880
  Website: www.cleancaribbean.org
* East Asia Response Ltd
  Jeff Tang
  Training/ Information Officer
  East Asia Response Pte Ltd
  2 Jalan Samulun

Singapore 629120
Tel: (65) 266 1566
Fax: (65) 266 2312
E-mail: jkstang@earl.com.sg
Website: http://www.earl.com.sg

INTERNATIONAL ORGANIZATIONS

IMO/PARIS MOU & other MOUs
Governmental adresses: IMO MSC/Circ 838 (or MEPC/6 Circ 3), latest update 9 March 1998.

IMO
4 Albert Embankment
London SE1 7SR
United Kingdom
Tel: 44 171 735 7611
Fax: 44 171 587 3210
E-mail: info@imo.org
Website: http://www.imo.org for comprehensive listing of maritime organizations

See: IMO Library Directory of Maritime Links on IMO Home Page. The Directory lists over 1,200 internet sites by main subjects.
Website: http://www.imo.org/imo/library/literature/litstart.htm for bibliography of maritime literature

ITOPF
The International Tanker Owners Pollution Federation (ITOPF) is a non-profit making organisation, involved in all aspects of preparing for and responding to oil spills from tankers. ITOPF's history stretches back to 1968. It was established after the *Torrey Canyon* incident to administer the voluntary compensation agreement, TOVALOP, which assured the adequate and timely payment of compensation to those affected by oil spills. TOVALOP came to an end on 20th February 1997. As a result the membership and funding arrangements of the Federation have now changed. ITOPF now devotes considerable effort to a wide range of technical services, of which the most important is responding to oil spills. ITOPF's small response team is at constant readiness to assist at marine oil spills anywhere in the world. This service is normally undertaken on behalf of our tanker-owner members and their oil pollution insurers (normally one of the P&I Clubs) or at the request of governments or international agencies such as the International Oil Pollution Compensation Fund. Other services we provide include damage assessment, contingency planning, training and inform-

ation. The Federation maintains an extensive library and a number of databases, and produces technical publications and videos.

Dr. Ian White
The International Tanker Owners Pollution Federation Limited
Staple Hall
Stone House Court
87–90 Houndsditch
London EC3A 7AX
United Kingdom
Tel: +44 20 7621 1255,
Fax: +44 20 7621 1783,
24 hr: 44 142 691 4112
E-mail: central@itopf.com
Website: http://www.itopf.com: contact details for the P&I Clubs, a number of government departments, response organisations, shipping associations etc are available, accessed via the 'Further Information' section.

IOPC FUND
Mr. Måns Jacobsson, Director
International Oil Pollution Compensation Fund
4 Albert Embankment
London
SE1 7SR
United Kingdom
Tel: +44 171 582 2606
Fax: +44 171 735 0326
E-mail: iopcfund@dircon.co.uk
Website: http://www.iopcfund.org
Civil liability for oil pollution damage and the International Fund for Oil Pollution Compensation, 1992 CLC and FUND Conventions.

PORT STATE CONTROL

US Coast Guard Links Website: http://psix.uscg.mil/CGLinks.asp
For statistics re spills—Website:http://uscg.mil/hq/g

GOVERNMENT

AUSTRALIAN MARITIME SAFETY AUTHORITY
Mr Ray Lipscombe, Manager Environment Protection,
Maritime Operations,

GPO Box 2181 Canberra, ACT 2601,
Tel: +61 2 6279 5929
Fax: + 61 2 6279 5076
E-mail: ray.lipscombe@amsa.gov.au
Website: http://www.amsa.gov.au/

EQUASIS
Willem de Ruiter
Head of Division
Maritime Safety Unit
European Commission
Tel: +32-2-296 8265
Fax: +32-2-296 9066
Website: http://www.equasis.org

USEPA
EPA Oil Program
401 M St., SW (5202G)
Washington DC 20460
Tel: 703 603 8735
Fax: 703 603 9116
Website: http://www.epa.gov/oilspill/index.htm
E-mail: : Dana Stalcup, stalcup.dana@epamail.epa.gov,
US Environmental Protection Agency—Tel: 1-800-424-9346;

USEPA National Response Team
NRT Chair: Jim Makris
Tel: 202-260-8600
Fax: 202-260-0154 or 7906
E-mail: makris.jim@epamail.epa.gov/ jim_makris@hazmat.noaa.gov

NOAA/HAZMAT
US Commerce Dept. (NOAA)
Website: http://www.darp.noaa.gov; www.noaa/gov/guide/sciences/ocean/marinepoll.html

NOAA Office of Response and Restoration
7600 Sand Point Way NE
Seattle, WA 98115
Tel: (206) 526-6317 24-Hour Line
Fax: (206) 526-6329 Fax Line (not attended 24 hours)
Ask for Duty Officer to be paged for emergencies.
Web Site: http://response.restoration.noaa.gov

National Response Team: CAPT Gary Van Den Berg
E-mail: gary_vandenberg@hazmat.noaa.gov

NOAA Hazardous Materials Response Division
7600 Sand Point Way, NE
Seattle, WA 98115
Tel: 206-526-6319
Fax: 206 526 6329
NOAA HMRD E-mail: Robert Pavia, Robert.Pavia@hazmat.noaa.gov

NOAA Office of Response & Restoration, National Ocean Services
Bldg. 4, Room 10409
1035 E. W. Highway
Silver Springs, MD 20910
Tel: 301-713-2989
Fax: 301-713-4387
E-mail: dave.kennedy@noaa.gov

US Interior Dept.
Mail Stop 2340
1849 C Street, NW
Washington, DC 20240
Tel: 202-208 3891
Fax: 202-208 6970
National Response Team: Dr. Willie R. Taylor
E-mail: willie_taylor@ios.doi.gov

OFFICE OF PIPELINE SAFETY, USDOT:
US Department of Transportation
400 7th Street, SW, DPS-11
Washington, DC
Fax: (202) 366-4566
E-mail: James Taylor, jim.taylor@rspa.dot.gov
Website: http://www.ops.dot.gov

US Coast Guard:
Coast Guard Headquarters National Response Center (202-267-6352)
The Incident Management Center (202-267-2101),
The Office of Response (G-MOR at 202-267-0518)
The Response Operations Division (G-MOR-3 at 202-267-6860).
Website: htttp://www.uscg.mil/hq/g-m/gmhome.htm
USCG website. http://www.uscg.mil

Web site contains the phone book for the entire "M" organization within the USCG.

National Response Team Standing Committees, Key Persons:
CDR John Weber, Chair,
Commandant (G-MOR)
US Coast Guard
2100 2nd St., SW, Room 2100
Washington, DC 20593
Tel: 202-267-6716
Fax: 202-267-4085
E-mail: jweber@comdt.uscg.mil

US Coast Guard National Pollution Funds Center (for Federal COFR requirements):
Website: http://www.uscg.mil/hq/npfc/npfc.htm

National Response Center
2100 Second St. S.W.
WA, D.C. 20593-0001
Tel: 202-267-2675
Fax: 202-267-2165
Director: CDR A.M. Qadir

MSA Panama
Panama Canal Commission
Marine Safety Unit (MRD M)
Unit 2300
APO AA, 34011-2300
Advisor: Capt. William Hutmacher
Tel: 011-507-272-4061
Fax: 011-507-272-3965

THE OIL SPILL LIABILITY TRUST FUND:
The Oil Pollution Act authorizes use of the Oil Spill Liability Trust Fund (OSLTF) as a source to fund certain oil removal costs, and damages resulting from a discharge or substantial threat of discharge of oil to navigable waters of the US

The OSLTF is administered by the Coast Guard National Pollution Funds Center (NPFC) and consists of the *Principal Fund* and an *Emergency Fund* component. The Emergency Fund is used to fund removal actions by Federal On-Scene Coordinators, initiate Natural Resource Damage Assessments and provide funding access for immediate removal actions by States. The Principal Fund is used to pay claims and for Congressional appropriations to implement, administer and enforce other OPA requirements. Claims may be submitted for uncompensated removal costs determined

to be consistent with the National Contingency Plan or for certain uncompensated damages, including natural resource damages, if the responsible owners or operators of discharging vessels and facilities do not pay. Oil spill response organizations should consider this funding resource to recover costs associated with removal actions.

OPA also mandates the scope and limits on liability for owners and operators of vessels and facilities from which oil is discharged or poses a substantial threat of discharge. The NPFC administers the certification of financial responsibility (COFR) program for vessel owners and operators. The COFR program is designed to ensure that vessel owners and operators have the financial means to pay removal costs and damages when their vessel discharges oil.

National Pollution Funds Center (federal government) Key Points of Contact:

National Pollution Funds Center (cs)
4200 Wilson Blvd., Suite 1000
Arlington, Virginia 22203
Acting Director: *Ms. Jan Lane*, Tel: (202) 493-6700
Chief, Case Management Division: *Mr. Timothy Eastman*, Tel: (202) 493-6721
Chief, Claims Division: *Ms. Linda Burdette*, Tel: (202) 493-6831
Chief, Natural Resource Damage Claims Division: *Mr. Frank Wood*, Tel: (202) 493-6860
Chief, Certificate of Financial Responsibility Division: *Mr. Ed Armstrong*, Tel: (202) 493-6780
Chief, Financial Management Division: *Mr. Darrell Neily*, Tel: (202) 493-6800

Who to Contact for Information Related to US Federal Oil Pollution Programs, Regulations, Policies and Publications:

Ms. Dana Compton
Acting Chief, Customer Services Division
National Pollution Funds Center (cs)
4200 Wilson Blvd., Suite 1000
Arlington, Virginia 22203
Tel: (202) 493-6719
Fax: (202) 493-6901 (fax)
E-mail: dcompton@ballston.uscg.mil

The NPFC worldwide website address is: www.uscg.mil/hq/npfc/npfc.htm

US Vessel Response Plan requirements for tankers:
Website: http://www.uscg.mil/vrp/

USCG Captain of the Port: For Area Contingency Plan.
Tel: 510 437-3135
Fax: 510 437-3072
E-mail: hhenderson@d11.uscg.mil

US Dept. of the Interior
Tel: (202) 208-3100;
Website: http://www.doi.gov/indexj.html

US Fish & Wildlife Service
Website: http://www.fws.gov

ACADEMIA/TRAINING
Centre for Maritime Policy
E-mail: cenmarpol@uow.edu.au
Website: http://www.uow.edu.au/arts/cenmarpol

Center for Maritime Leadership, Inc.
955 L'Enfant Plaza, S.W., Suite 1101
WA, DC 20024
Tel: 202-554-8550
Fax: 202-554-8578
E-mail: nlemley@email.msn.com
maritimeleadership.com, northeastmaritime, dominica-registry.com

Houston Marine
5728 Jefferson Highway
New Orleans, LA 70214
Tel: 1-800-947-773
Fax: 1-504-729-4451
E-mail: greg@examco.com
Website: http://www.houstonmarine.com
Greg Szczurek

Maine Maritime Academy
Center for Maritime Studies
Castine, ME 04420
Tel: 800-227-8465/207-326-4311
Website: http://www.mainemaritime.edu

Texas A&M Center for Maritime Training and Safety
TEEX Spill Control Program

8701 Teichman Road
Galveston, TX 77554
Tel: 409-740-4850
Fax: 409-744-2890
E-mail: cmts@teexnet.tamu.edu
Website: http://www/tamu/edu/teex/dir/cmts

National Spill Control School
Texas A&M University—Corpus Christi
Persons wishing to contact the National Spill Control School can do so by calling or by writing:
Steven Barnes, David Jensen & Roy Coons
NRC Suite 1100
6300 Ocean Drive
Corpus Christi, TX 78412
Tel. (361) 825-3333
Fax: (361) 825-3337
E-Mail: nscs@tamucc.edu, SBarnes@falcon.tamucc.edu,
DJensen@falcon.tamucc.edu, RCoons@falcon.tamucc.edu
Additional information and a schedule of classes for the year 2000 can also be obtained on the web at http://www.sci.tamucc.edu/nscs

World Maritime University
PO Box 500
S-201 24
Malmo, Sweden
Susan Jackson
Assistant Academic Registrar
Tel: 46 40 35 63 32
Fax: 46 40 12 84 42
Website: http://www.wmu.se

Cordah Limited
Kettock Lodge
Aberdeen Science and Technology Park,
Bridge of Don,
Aberdeen, AB22 BGU
Tel: 44 1224 414250
Fax: 44 1224 41 42 50
E-mail: main@cordah.co.uk
Website: http://www.cordah.co.uk/

SCIENTIFIC

Advanced Technology Research Project (ATRP) Corporation
P.O. Box 2439
7000 Vagabond Drive
Falls Church, VA 22042-3934 USA
Tel: (703) 237-0505
Fax: (703) 241-1278
E-mail: machamp@aol.com
Michael A. Champ, PhD
President & CEO
The ATRP (Advanced Technology Research Project) Corporation supports the evaluation and decision-making needs of corporations and governments related to development and marketing of new and advanced environmental technologies, utilizing environmental needs and product performance data, and in depth market assessments. ATRP's objective is to independently integrate all the information necessary for assessment of risks and identification of options for decision-making, performance monitoring protocols, sales management and then develops a marketing strategy and technology development and marketing business plan.

Dagmar Schmidt Etkin, Ph.D.
Environmental Research Consulting
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E-mail: detkin@dellnet.com

Atle B. Nordvik
President
Environmental Marine Technology & Associates
2230 Central Avenue
Vienna, Virginia 22182-5193 USA
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Fax: (703) 698-2632
E-mail: abjnordvik@aol.com

Det Norske Veritas
Section of Environmental Advisory Services
Veritasveien 1
Postbox 300
1322 Hovik
Norway

Contact (environmental risk): Kjell Andreas Jodestol
Tel: +47 67 57 89 95
Fax: +47 67 57 74 74
Fax +47 67 57 91 60
E-mail: kjell.andreas.jodestol@dnv.com

Contact (oil spill contingency): Bjorn Olaf Johannesen
Tel: +47 67 57 97 35
Fax: +47 67 57 74 74
Fax: +47 67 57 91 60
E-mail: bjorn.olaf.johannessen@dnv.com

Research Planning Inc.
PO Box 328
Columbia, S.C. 29202
Tel: 803-256-7322
Fax: 803-254-6445
Website: http://www.researchplanning.com
E-mail: jmichel@researchplanning.com
Jacqueline Michel, Ph.D.

Research Planning, Inc. (RPI). Private consulting company which specializes in oil spill planning, response, and research. RPI has been under contract to NOAA as part of the Scientific Support Team to the US Coast Guard for oil and chemical spills nationwide in navigable waters. RPI generates the Environmental Sensitivity Index (ESI) maps and databases published by NOAA. RPI specializes in shoreline assessment, cleanup methods, and natural resource damage assessment.

Sintef Applied Chemistry - Environmental Engineering:
Website: http://www.sintef.no/units/chem/environment/

SHIPPERS/SHIPPING ASSOCIATIONS

Australian Federation of Shipping
Tel: +61 3 9646 0755

Australian Maritime Safety Authority,
GPO Box 2181 Canberra ACT 2601,
Tel: +61 2 6279 5040,
Fax: +61 2 6279 5026,
E-mail: wayne.stuart@amsa.gov.au
Mr Wayne Stuart, Manager Environment Protection Standards, Maritime Safety and Environmental Strategy

AWO
American Waterways Operators
1600 Wilson Boulevard, Suite 1000
Arlington, VA 22209
Tel: 703-841-9300
Fax: 703-841-0389
E-mail: Awo-Midcongtinetn@msn.com
Website: http://www.americanwaterways.com
AWO represents the coastal and inland tuboat, towboat and barge industry.
Convention Contact: Marilyn Clark, Membership & Meetings Coordinator
Laws & Regs Contact: Jennifer Kelly, Vice President—Public Affairs
Publications Contact: Anne Davis Burns, Director—Public Affairs

BIMCO:
The Baltic and International Maritime Council (BIMCO)
161 Bagsvaerdvej
DK-2880 Bagsvaerd
Denmark
Tel: +45 44 44 45 00
Fax: +45 44 44 50 60
E-mail: mailbox@bimco.dk
Website: http://www/bimco.dk
Mr. Finn Frandsen, Secretary General
Captain Steen Peterson, Deputy Secretary General

Chamber of Shipping
The Carthusian Court
12 Carthusian St.
London EC1M 6EB, UK
Tel: 44 171 417 840
Fax: 44 171 796 181
E-mail: postmaster @british-shipping.org

US address
1730 M St., NW
Suite 407
WA, DC 20036-4517
E-mail: joejcox@mou.com (Joe Cox)

European Community Shipowners' Associations
Rue Ducale 45, B-1000
Brussels, Belgium
Tel: 02 511 3840
Fax: 02 511 8092

IPIECA
International Petroleum Industry Environmental Conservation Assoc.
2nd Floor, Monmouth House,
87–93 Westbourne Grove
London, England W2 4UL, UK
E-mail: Bill.M.Lerch@exxon.com
Website: http://www.ipieca.org

International Shipping Federation
Carthusian Ct., 12 Carthusian St.
London BC1M 6EB, England
Tel: 44 171 417 8844
Fax: 44 171 417 8877
E-mail: isf@marisec.org (Simon Bennett)

INTERTANKO
INTERTANKO is the International Association of Independent Tanker Owners. The INTERTANKO membership fleet numbers 2,073 tankers with a total tonnage of 176 million tons deadweight. This is equivalent to 75 per cent of independently owned tanker tonnage worldwide. Ownership of this diverse fleet of tankers is spread amongst 270 owners in 45 countries worldwide. The Association also has an associate membership of 296 companies and organisations in 50 countries providing equipment and services to the tanker industry.

INTERTANKO was established in 1971 to represent the interests of independent tanker owners worldwide, and has, as its three central aims, safe ships, clean seas and free competition. With a Secretariat numbering 30 people, the Association maintains a strong proactive stance in its efforts to represent the tanker industry effectively at international, regional, national and local levels. In addition to its headquarters in Oslo, INTERTANKO also has offices in London, Washington, DC and Singapore.

INTERTANKO HEAD OFFICE:
Dagfinn Lunde, Managing Director
Bogstadveien 27B
P.O. Box 5804 Majorstua
0308 Oslo, Norway
Tel: (47) 22 12 26 40
Fax: (47) 22 12 26 41
Website: http://www.intertanko.com
E-mail: postmaster@intertanko.com

INTERTANKO US Representative Office:
Svein Ringbakken, Sr. Vice President & General Counsel

1250, 24th Street
N.W. Suite 700
Washington DC 20037, USA
Tel: (1) 202 659-6631
Fax: (1) 202 659-6606
xE-mail: svein.ringbakken@intertanko.com

INTERTANKO Asia Representative Office:
Minerva Alfonso, Manager, Asian Representative Office
5 Temasek Boulevard
12-01 Suntec City Tower
Singapore 038985
Tel: (65) 333 4007
Fax: (65) 333 5004
E-mail:minerva.alfonso@intertanko.com

INTERTANKO London Representative Office:
Robert Bishop, Marine Manager
Baltic Exchange
38 St. Mary Axe
London EC3A 3BH, UK
Tel: (44) 171 623 4311
Fax: (44) 171 626 7078
E-mail: robert.bishop@intertanko.com

OTHER MARITIME ORGANIZATIONS (Websites):

These are updated biannually at the *Spill Science & Technology Bulletin* Website.

Bennie's Merchant Marine Pages: http://www/sea-man.com
International Transport Workers Federation: http://www.itf.org.uk
Lloyd's List: http://www.llplimited.com
Maritime Cabotage Task Force: http://www.mctf.com
Maritime Global Net: http://www.mglobal.com
Seafarers International Union: http://www.seafarers.org
US Maritime Administration: http://www.marad.dot.gov

CLASSIFICATION SOCIETIES (Selected)

AMERICAN BUREAU OF SHIPPING
ABS Europe Ltd.
ABS House

No. 1 Frying Pan Alley
London, E17 HR, UK
Tel: 44 171 377 4528
Fax: 44 171 377 2453
E-mail: mpearson@eagle.org (Michael Pearson)
Website: http://www.eagle.org

ABS Americas
ABS Plaza
16855 Northchase Drive
Houston, TX 77060
Tel: 281-877-6000
Fax: 281-877-6001
E-mail: abs-amer@eagle.org

ABS Group Inc.
ABS Plaza
16855 Northchase Drive
Houston, TX 77060
Tel: 281-877-6100
Fax: 281-877-5925
Website: http://www.abs-group.com

CBS
6 Rigas Fereos Street
PO Box 214
Limassol CY-3602, Cyprus
Tel: 3575 343321
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Website: http://www.ukpandi.com: provides links to all other P & I clubs.

Some Sites:

UK Club http://www.ukpandi.com
London Club http://www.Isso.com
Steamship Mutual http://www.ssmua.com
North of England http://www.nepia.com
Skuld http://www.skuld.com
American Club http://www.american-club.com

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Subject: General Information on IMO and its Conventions
IMO Information Officer

Subject: Protection of the marine environment; control of pollution from ships (MARPOL 73/78), oil spill preparedness, response and co-operation (OPRC 1990), dumping of wastes, generated on land (LDC 72 and LC 96)
Marine Environment Division

Subject: Information related to maritime safety, communication, facilitation, ships construction, cargoes, piracy, manning, training and education of seafarers (SOLAS 74/76/88, TONNAGE 69, COLREQ 72, LOAD Lines 66/88, SAR, SALVAGE, FAL, STCW, IMDG—Code)
Maritime Safety Division

Subject: Information related to legal matters on any IMO Instrument
Legal Affairs and External Relations Division

Subject: Information related to technical cooperation and assistance and regional offices of IMO
Technical Co-operation Division

Subject: Information related to purchase of any IMO publication
IMO Publications Sales Unit

ITF
The initials ITF stand for the International Transport Workers' Federation, a global organization of transport workers' unions. The ITF brings together some 533 unions in more than 136 countries in every part of the world, and representing over 5 million trade union members in every branch of transport.

The ITF exists to provide help and support for its affiliated unions. It fights for social justice, against unemployment and poverty, for decent wages and working conditions and for a safe and healthy working environment. It is dedicated to the advancement of free and democratic trade unionism and to the defense of fundamental human and trade union rights. It believes in the need for a social dimension to all international and regional free trade arrangements.

The ITF also campaigns on behalf of its affiliates for an integrated and environmentally responsible approach to transport policy, both nationally and internationally. It supports an approach to transport planning which recognizes the importance of transport systems to sustainable economic development and promotes the development of efficient public transport offering a quality service to users and safe and attractive working conditions to transport employees.

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Organization/agency:	US Coast Guard
Organizational element:	National Maritime Center (NMC)
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Subject:	US regulations pertaining to the STCW Convention
Organization/agency:	US Coast Guard
Organizational element:	Maritime Personnel Qualifications Division (G-MSO-1)
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Subject:	US activities associated with Port State Control
Organization/agency:	US Coast Guard
Organizational element:	International Compliance and Outreach Division (G-MOC-4)
Telephone number:	+202-267-1043

Subject:	Manning requirements on US ships
Organization/agency:	US Coast Guard
Organizational element:	Vessel Compliance divisions (G-MOC-2)
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Subject:	Port and facility regulations
Organization/agency:	US Coast Guard
Organizational element:	Port and Facilities Compliance divisions (G-MOC-3)
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Subject:	Lessons Learned
Organization/agency:	US Coast Guard
Contact(s):	The Coast Guard Standard After Action, Information and Lessons Learned
Website:	http://cgsails.nctsw.navy.mil/default.htm

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Publication Information Contacts

Who to contact for information related to:
Publications, Newsletters, Journals etc. related to oil spills

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The Fairplay Shipping Guide, 1999
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Cutter Information Corp.

Newsletter: Oil Spill Intelligence Report (OSIR)
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Oil Spills First Principles: Prevention and Best Response. Edited by B.E. Ornitz and M.A. Champ
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Lloyd's Register of Shipping

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Golob's Oil Pollution Bulletin
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Website: http://www.worldinfosystems.com

Journal of Maritime Law and Commerce

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Lloyd's Nautical Yearbook 1999

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Spill Science & Technology Bulletin

Elsevier Science Ltd
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Falls Church, VA 22042-3934
Website: http://www.elsevier.nl

Keyword: Spill

Spill Science & Technology Bulletin is an international, peer-reviewed journal on oil and chemical spill science and technology focusing on the effects and control of discharges of oil, oil products and other hazardous substances. It includes Research papers, Review papers, Viewpoint articles, Technical notes and Technical product news, as well as section for Book Reviews and Announcement of Conferences of general interest to the spill community. Subjects treated are engineering developments, including equipment performance assessments as well as scientific issues, and physical, chemical and biological research findings. Both land and water spill issues are addressed and papers linking science and technology with policy and management matters (including economics) are also considered appropriate. The unique aspect of the journal is its focus on solutions, rather than identification of the impacts of oil and chemical spills, derived through enhancements in basic knowledge and development of new methodologies and advanced technologies.

USCG

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Organization/agency:	U.S. Coast Guard
Organizational element:	USCG National Maritime Center
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Subject:	Marine Safety Council Proceedings
Organization/agency:	US Coast Guard
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USCG Office of Investigations & Analysis
Office of Investigations and Analysis
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Website: http://www.uscg.mil/hq/g-m/moa/filter.htm and click casualty reports.

The Coast Guard headquarters Office of Investigations and Analysis (G-MOA) has recently completed placing approximately 280 marine casualty reports on line. These reports in Adobe pdf format date back to 1949. A wide range of interesting casualty information is presented.

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