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 statutory 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;

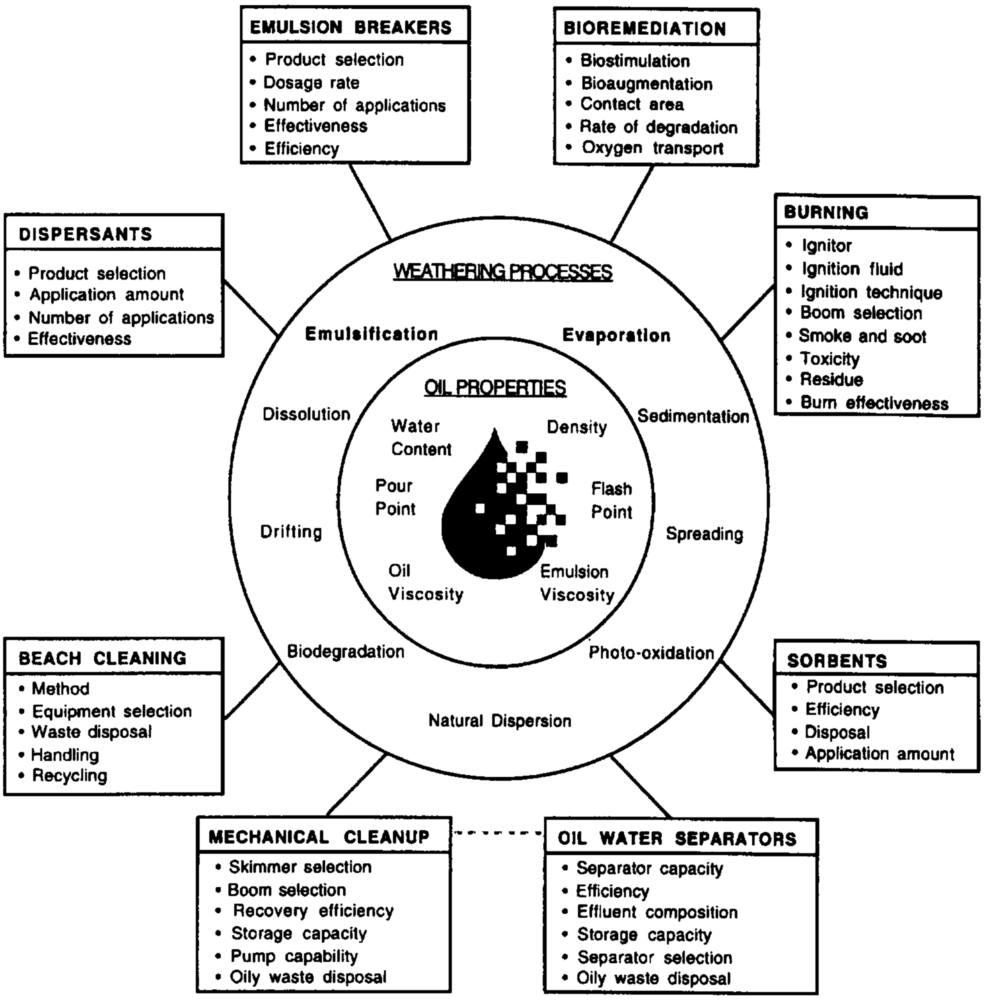

Fig. 1. Oil weathering processes impacts the effectiveness of selected technologies for oil spill response.

- 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 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.

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.

We would like to thank John Kaperick of the NOAA Office of Response and Restoration who so kindly helped in securing the color photographs presented of oil spills throughout the book from the NOAA OR&R Photo Database. In addition, the book's cover photograph was provided by Joe Smith of Foss Environmental and Environment Canada.

The following individuals are to be thanked for their contributions to this book. They have been extremely kind in providing extensive knowledge and information to assist us in preparing this work. They have either provided background material, granted interviews and answered numerous written questions on technical aspects of law, policy, and regulations or assisted through reviews of manuscripts, or serving as peer reviewers: Robert Aldag, Thomas A. Allegretti, Don Aurand, Jane Barrett, Brad Benggio, Simon Bennett, Kennith R. Bitting, Edward Brans, Linda Burlington, George Burns, Ian Buist, Nigel Carden, Timothy Close, Blaine Collins, Dennis Compton, Joe Cox, Tim Dickensheets, Richard T. duMoulin, William Eglington, J.C. Wiegman, William Provost Eisenhardt, Dagmar Schmidt Etkin, Merv Fingas, Andrew Garger, Richard Hobbie, Robert Gauvin, Randy Gilbert, Thomas Gilmour, Ron H. Goodman, Harry Grell Cathy Shantz Hammond, John Hannon, Harlan Henderson, Larry Hereth, Charles Huber, Kjell Andreas Jodestol, Bob Johannes, Michael Julian, David Kennedy, J. William Kime, Lee Kincaid, Jim Lane, Norman Lemley, Sally Lentz, Tod A. Lyons, David Martowski, Michelle Mayer, Howard McCormack, Alan Mearns, Jacqueline Michel, Mark Miller, Thomas Moore, Kieran Mulvaney, Atle B. Nordvik, Eugene O'Connor, William A. O'Neal Tom Ostensen, John Ostergaard, Joe Mullin, Michael Pearson, Fernando Plaza, Captain Marvin Pontiff, Svein Ringbakken, Robert Ross, Helena Rowland, Martin Rowland, Fred Scheer, Daniel Sheehan, Gary Shigenaka, Steven P. Solow, Jay Sterne, John Sterne, Greg Szczuzurek, Michael Voogel, Douglas Walton, John Weber, Ian White, Jon Whitlow, Malcolm Williams, Andy Winbo, Paul Wotherspoon, Chao Wu, and Chris Young. Over the multiple years of working on this book, we may have left someone out and apologize for such.

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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