*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

*Oil Spills First Principles: Prevention and Best Response. Edited by B.E. Ornitz and M.A. Champ*

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).

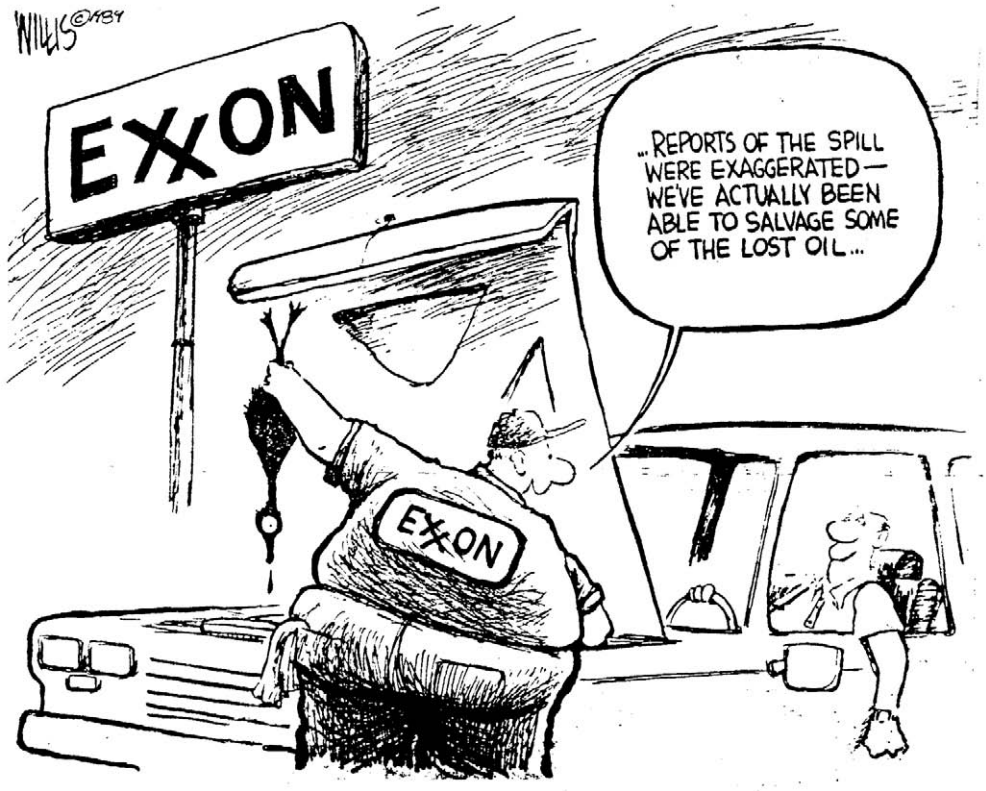
Helton (1997) suggests that responders are faced with a series of policy decisions: about the relationship between response and damage assessment costs, how funds should be allocated between the activities of response and restoration, and whether we are wisely spending our dollars now in oil spill response. 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).

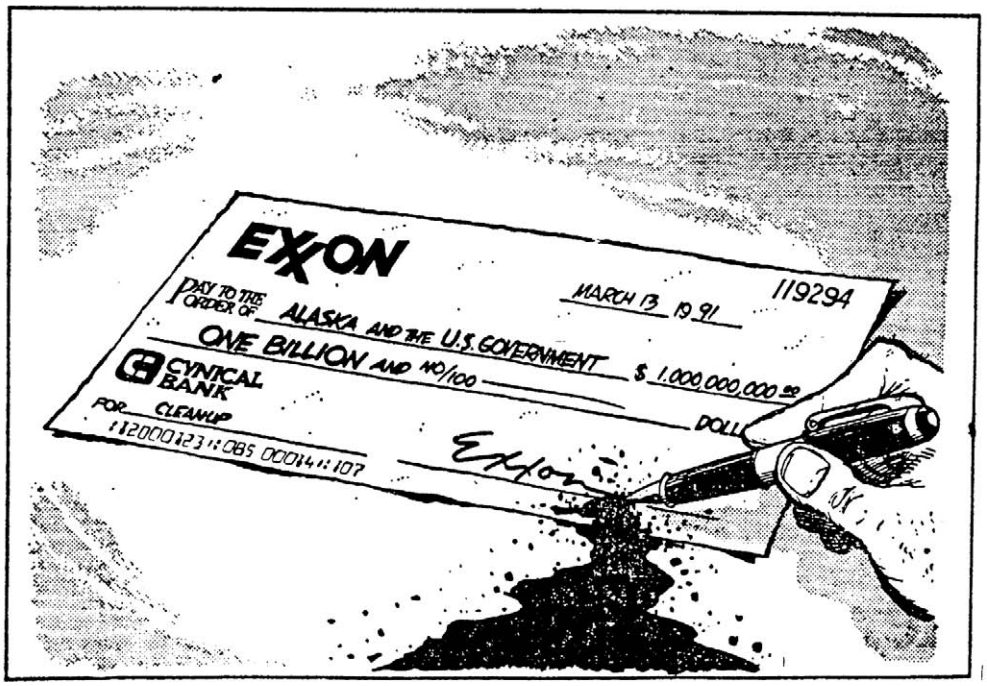
the subsidiaries and parent company involved, and the CEO sentenced to a jail term (Ornitz, 1996). Oil spills result in tangible, direct losses in life, injuries, damage to the environment, cargo, and vessel, loss of time, loss of consumer base, and many indirect costs. Perhaps most significantly, a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

## References

Allegretti, Thomas 1999a. President of American Waterways Operators, personal interview, 26 January 1999.

AWO (American Waterways Operators) 1998. Annual Report. Arlington, VA, 12pp.

Card, Rear Admiral, US Coast Guard 1996. Safety is good business. Conference on Market Mechanisms for Safer Shipping and Cleaner Oceans, Mare Forum. Erasmus University, Rotterdam (unpublished manuscript) 21pp.

Center for Maritime Leadership 1997. CML mission. Mt. Jackson, VA, 8 November 1997 (unpublished manuscript).

Champ, Michael A. 1999. An overview of the science and regulation of TBT and the potential for future liability for contaminated harbor sediments, in: Champ, Fox and Mearns (Eds.), Treatment of Regulated Discharges from Shipyards and Drydocks. Proceedings of the Special Sessions held at Oceans '99 in Seattle Washington, 13–16 September 1999, Vol. 4. The Marine Technology Society, Washington, DC, pp. 137–152.

Champ, Michael A. 2000. A review of organotin regulatory strategies: Pending actions, related costs and benefits, Science and the Total Environment 258(1): 21–71.

Collins, Blaine 1999. Head of Business Area. Maritime North America for Det Norske Veritas, River Edge, NJ, personal interview, 11 February 1999.

Cremers, P. 1996. Quality is Free. BIMCO Review. Ship Management, Denmark, pp. 287–288.

Davidson, David A. 1995. Comments during session W2B: Inspection and maintenance. Proceedings of the 1995 International Oil Spill Conference, Long Beach, CA. American Petroleum Institute, Washington, DC.

du Moulin, Richard T. 1998. INTERTANKO AGM Dinner Speech, Singapore. INTERTANKO, New Jersey, May 1998 (unpublished manuscript).

du Moulin, Richard 1999. President Marine Transport Corporation; Former Chairman of INTERTANKO, Weehawken, NJ, personal interviews, 15, 21 April 1999.

Duncan, P. Bruce and A.J. Hooten 1996. Influence of residual and applied oil on intertidal algal recruitment, American Fisheries Society Symposium 18: 238–248.

Etkin, Dagmar Schmidt 1998. Financial Costs of Oil Spills in the United States. Cutter Information Corp, Arlington, MA, pp. 35–36, 57–59.

Etkin, Dagmar Schmidt 1999. Estimating cleanup costs for oil spills. In: Proceedings of the 1999 International Oil Spill Conference. American Petroleum Institute, Washington, DC, pp. 35–39.

Etkin, Dagmar Schmidt 1999. Former Senior Oil Spill Research Analyst. Cutter Information Corp, personal interview, 14 July 1999.

Etkin, Dagmar Schmidt, M. Nauke, J. Koefoed, P. Johnston, P. Wells, J. Campbell, T. Meyer and C. Grey

1999. Estimates of oil entering the marine environment in the past decade. GESAMP Working Group 32 Project. Proceedings of the 1999 International Oil Spill Conference. American Petroleum Institute, Washington, DC, pp. 1093–1096.

Evans, R. Keith 1999. Research and shipping development—Loss control in shipping and shipbuilding. Det Norske Veritas, 10 February 1999 (unpublished manuscript).
Website: (one.dnv.com/presentations/Evans/DNVARTIC.13.html).

Fullwood, Capt. Kenneth J. 1997. Building a culture for safety and the environment at Mobil Shipping. Presented at SASMEX International '97, 30 April 1997 (unpublished manuscript) 6pp.

GESAMP 1993. Impact of oil and related chemicals and wastes on the marine environment. GESAMP Reports and Studies, No. 50, IMO, London, UK, 180pp.

Gilbert, Randall R. 1997. Economic benefits of pro-active safety management. Proceedings of the Marine Log Conference. Maritime Operations: The Human Element. Washington, DC, 28, 29 April 1997 (unpublished manuscript).

Gilbert, Randall R. 1999. Co-founder of the Center for Maritime Leadership. Mt. Jackson, VA. personal interview, 21 January 1999.

Gilfillan, D.S., J.C. Foster, J.R. Hotham and L. Gonzalez 1999. Mangrove leaf tissue sodium and potassium ion concentrations as sublethal indicators of oil stress in mangrove trees. Proceedings of the 1999 International Oil Spill Conference, American Petroleum Institute, Washington, DC, pp. 119–126.

Gilfillan, D.S., D.S. Page, J.M. Neff, K.R. Parker and P.D. Boehm 2000. 1999 shoreline conditions in the *Exxon Valdez* oil spill zone in Prince William Sound. Proceedings of the 23rd Arctic and Marine Oilspill Program (AMOP) Technical Seminar, Vol. 1, pp. 281–294.

Gilmour, Capt. Thomas 1998. US Coast Guard; Former Director of Field Activities; Chief of Staff, Commander 13th USCG District, personal interview, 9 November 1998.

Gilmour, Capt. Thomas H. 1998. US Coast Guard's perspective on ISM compliance: A status report. Proceedings of Marine Log. Tanker and Maritime Legislation. Washington, DC, 22 September 1998.

Gilmour, Capt. Thomas and Lt. D. Drury 1999. Port State control in the United States (with an emphasis on ISM & STCW enforcement). USCG, Washington, DC (unpublished manuscript) 4pp.

Golob's Oil Pollution Bulletin 1997. Activists Press Environmental Issues at Oil Company Meetings. World Information Systems, Cambridge, MA, 23 May, pp. 1–3.

Golob's Oil Pollution Bulletin 1998. International Safety Management Code Enters into Force. World Information Systems, Cambridge, MA, 10 July, pp. 1, 4.

Golob's Oil Pollution Bulletin 1998a. Clinton Extends Offshore Oil Drilling Ban by 10 Years. World Information Systems, Cambridge, MA, 19 June, pp. 1, 3.

Grey, Catherine 1999. The cost of oil spills from tankers: An analysis of IOPC Fund incidents. Proceedings of the International Oil Spill Conference. American Petroleum Institute, Washington, DC, pp. 41–47.

Helton, Douglas and Tony Penn 1999. Putting response and natural resource damage costs in perspective. Proceedings of the International Oil Spill Conference. American Petroleum Institute, Washington, DC, pp. 577–583.

Henderson, Capt. Harlan 1999. Former US Coast Guard Commanding Officer, Marine Safety Office, San Francisco Bay, CA, personal interview, 22 April 1999.

Hoff, Rebecca Z. and Gary Shigenaka 1999. Lessons from ten years of post-*Exxon Valdez* monitoring on intertidal shorelines. Proceedings of the International Oil Spill Conference. American Petroleum Institute, Washington, DC, pp. 111–117.

Huber, Charles A. 1998. Former Manager of Environmental Affairs of Mobil Shipping and Transportation Company, personal interview, 4 December 1998.

Innovest Capital Risk Advisors, S.A. 1999. The petroleum industry: Hidden risks and value potential for

financiers and investors EcoRisc '21 Industry Sector. Research Series, Vol. I, No. 1, New York, May 1999.

INTERTANKO (International Association of Independent Tanker Owners) 1997. Annual Report and Review 1997, with Membership and Fleet Lists. INTERTANKO, Oslo, Norway, p. 3.

IMO (International Maritime Organization) 1997a. 70% of fleet set to meet ISM target. IMO News, London, UK, Vol. 4, pp. 13, 23.

IMO (International Maritime Organization) 1998. ISM Code becomes mandatory. IMO News, London, UK, Vol. 2, p. 4.

IMO (International Maritime Organization) 1998a. Oceans at risk? IMO News, London, UK, No. 3, pp. 23–25.

IOPC (International Oil Pollution Compensation Fund) 1999. Annual Report. London, UK, 171pp.

ITOPF (International Tanker Owners Pollution Federation Ltd) 1998. Coral Reefs: Physical Damage and Restoration. Ocean Orbit. London, UK September, 1998. p2.

The World Conservation Union (IUCN) 1993. Reefs at Risk: A Programme of Action. Gland, Switzerland, p. 13.

Kennedy, David 1999. Director of the Office of Response & Restoration, NOAA, Silver Spring, MD, personal interview, 22 March 1999.

Kime, Admiral J.W. 1999. Retired Commandant of the US Coast Guard; Vice President of Saltchuk Resources; Member of Executive Committee of BIMCO, Voorhees, NJ, personal interview, 25 May 1999.

Kingston, Paul 1999. Recovery of the marine environment following the *Braer* spill, Shetland. Proceedings of the 1999 International Oil Spill Conference, American Petroleum Institute, Washington, DC, pp. 103–117.

Lentz, Sally 1999. Director of Ocean Advocates, Clarkesville, MD, personal interview, 5 July 1999.

Lindstedt-Siva, June 1994. The need for experimental oil spills, Spill Science & Technology Bulletin 1(2): 97–100.

Lindstedt-Siva, June 1999. Judging oil spill response performance: The challenge of competing perspectives. Issue paper of the 1999 International Oil Spill Conference. American Petroleum Institute, Washington, DC, 32pp.

Louisiana Oil Spill Coordinator's Office 1998. Public affairs. Proceedings Oil Spill Response Management Training Program. Shreveport, Louisiana, March (unpublished manuscript) pp. 13-2–13-4.

Maitland, Guy E.C. 1997. Understanding all of the implications of ISM. Proceedings of MarineLog. Maritime Operations: The Human Element. Washington, DC, 28, 29 April 1997.

Marine Conservation Biology Institute 1997. Troubled waters: A call for action. Proceedings of the Annual Meeting of the Society for Conservation Biology, British Columbia, 4–6 June (unpublished statement).

Martowski, David 1999. Chairman, Thomas Miller (Americas) Inc; Chairman, Thomas Miller (Bermuda) Ltd, personal interview, 7 April 1999. Jersey City, NJ, personal communication, 8 September 1999.

Martowski, David 1998. ISM compliance: The reality. Presented at the Ninth Pacific Admiralty Seminar, San Francisco, CA, 8–9 October 1998 (as updated January 1999).

Martowski, David 1999. Amendments to ISM compliance: The reality. Presented to the Ninth Pacific Admiralty Seminar, San Francisco, CA, 8–9 October 1998. Letter dated 21 January 1999. Thomas Miller (Americas) Inc, Jersey City, NJ (unpublished manuscript).

Mearns, Alan and Debra Simecek-Beatty 1999. Small science, Spill Science & Technology Bulletin 5(2).

The Mellman Group 1996. Presentation of Findings from a Nationwide Survey and Focus Group, Washington, DC, June 1996 (unpublished report) 51pp.

The Mellman Group 1997. Results of our Recent Survey, Washington, DC, 19 September 1997 (unpublished report) 20pp.

Michel, Jacqueline 1999. Vice President for Science & Technology, Research Planning Inc, Columbia, SC, personal interview, 6 April 1999.

Michel, Jacqueline and B. Benggio 1999. Guidelines for selecting appropriate cleanup endpoints at oil spills. Proceedings of the International Oil Spill Conference. American Petroleum Institute, Washington, DC, pp. 591–595.

Mitchell, John G. 1999. Ten years after *Exxon Valdez*. National Geographic, Washington, DC, March, pp. 98–117.

Moore, Thomas 1999. President of Chevron Shipping Company, San Francisco, CA, personal interview, 11 May 1999.

NOAA (National Oceanic and Atmospheric Administration) 1999. Department of Commerce, Prince William Sound: Our Changing Perspective on Recovery. Washington, DC, March.

NOAA (National Oceanic and Atmospheric Administration) 1999a. Department of Commerce, Monitoring of Biological Recovery of Prince William Sound Intertidal Sites Impacted by the *Exxon Valdez* Oil Spill, 1997 Biological Monitoring Survey, Seattle, Washington, February 1999.

Office of the President 1998. Executive Order—Coral Reef Protection. The White House, Washington, DC, 11 June 1998.

OSIR (Oil Spill Intelligence Report) 1999. Court Posts UK Record $8 million Penalty for *Sea Empress* Spill, Vol. XXII. No. 3. Cutter Information Services, Arlington, MA, 21 January 1999.

OSIR (Oil Spill Intelligence Report) 2000. British Court Cuts Record UK Spill Fine, Vol. XXII, No. 12. Cutter Information Services, Arlington, MA, 23 March 2000, p. 5.

OSIR (Oil Spill Intelligence Report) 2001. US Commission on Ocean Policy Prepares to Tackle Tough Agenda. Vol. XXIV. No. 27. Cutter Information Services, Arlington, MA, 5 July 2001, pp. 1–2.

Ornitz, Barbara E. 1996. Oil Crisis in Our Oceans, Coral: Roadkill on the Petrohighway. Tageh Press, Glenwood Springs, CO, 340pp.

Ostergaard, John 1999. Senior Adviser on Marine Pollution, Marine Environment Division, International Maritime Organization, London, UK, personal interviews, 9, 23 March1999.

Page, D.S., P.D. Boehm, G.S. Douglas, J.S. Brown, A.E. Bence, W.A. Burns and P.J. Mankiewicz 2000. Mass balance constraints on the sources of the petrogenic hydrocarbon background in offshore sediments of Prince William Sound and the Gulf of Alaska. Proceedings of the 23rd Arctic Marine Oilspill Program (AMOP) Technical Seminar, Vol. 1, Environment Canada, Ottawa, Ontario, pp. 1–10.

Paris MOU 1998. Press Release—Paris MOU Advisory Board Announces Results on Compliance with ISM Code. The Hague, The Netherlands, 22 October 1998.

Paris MOU 1999. Press Release—Paris MOU Announces Concentrated Inspection Campaign on Large Bulk Carriers. The Hague, The Netherlands, 18 January 1999.

Pearson, Michael 1999. Head of Safety & Environmental Systems Certification, ABS Europe, personal interview, 15 April 1999; London, UK, personal communication, 9 August 1999.

Perry, Robin 1999. Myths and realities of oil spill planning and response: The challenges of a large spill. Issue paper presented in the Proceedings of the 1999 International Oil Spill Conference. American Petroleum Institute, Washington, DC, 54pp.

Pontiff, Capt. Marvin 1999. Address to IFSMA 25th Anniversary International Federation of Ship Masters Association Publication. US Coast Guard, Washington, DC (unpublished manuscript).

Rodriguez, Antonio J. and M.C. Hubbard 1999. The International Safety Management (ISM) Code: A New Level of Uniformity. Rice, Fowler, Kingsmill, Vance, Flint & Rodriguez, L.L.P. New Orleans, LA (unpublished manuscript).

Rowland, Capt. Martin 1998. Manager, Human Resources (Fleet Personnel), International Marine Transportation Ltd, Leatherhead, UK, personal interview, 17 November 1998.

Schrinner, Capt. John 1997. International Convention Requirements: ISM, STCW 95 & ILO 147, US

Coast Guard. Proceedings of Marine Log, Maritime Operations: The Human Element. Washington, DC, 28, 29 April 1997.

Sheehan, Daniel F. 1997. Money well spent or money just spent? The need for integrated cost accounting during spill response. Proceedings of the 1997 International Oil Spill Conference. American Petroleum Institute, Washington, DC, pp. 877–880.

Shigenaka, Gary 1999. Marine Biologist, US Department of Commerce, NOAA/Hazmat, Seattle, Washington, personal communication, 20 July 1999.

Shigenaka, Gary, M.A. McGehee, V.P. Vicente and C.B. Henry 1999. Biological effects monitoring during an operational application of COREXIT 9580. Proceedings of the 1999 International Oil Spill Conference. American Petroleum Institute, Washington, DC (Abstract).

Starr, Judson W. 1997. Let the lighthouse be a warning: The use of environmental sanctions against the maritime industry. Proceedings of Tanker & Maritime Legislation '97. MarineLog, Washington, DC, 23 September (unpublished manuscript).

Teas, Howard J., R.R. Lessard, G.P. Canevari, C.D. Brown and R. Glenn 1999. Saving oiled mangroves using a new non-dispersing shoreline cleaner. Proceedings of the 1999 International Oil Spill Conference. American Petroleum Institute, Washington, DC (Abstract).

Ullring, Sven 1996. Praise or absolution—How will we be judged on our environmental stewardship? Keynote address presented at the 1996 Annual Congress of the International Union of Marine Insurance: Environment and Marine Insurance. Det Norske Veritas, Oslo, Norway, 16 September 1996 (unpublished manuscript) 35pp.

Ullring, Sven 1996a. The active approach to safety: From reactive regulatory response to proactive safety management. Det Norske Veritas, Oslo, Norway. Presented at Stanford University, 11 March 1996, 21pp.

Ullring, Sven 1997. International shipping and the environmental challenge. Det Norske Veritas, Oslo, Norway. Presented at the 11th Chua Chor Teck Annual Memorial Lecture, Singapore, 10 January 1997. DNV Paper Series 96-P009, 51pp.

UK P&I Club 1996. Ship Inspection: A Report to the Members. Thomas Miller P&I Ltd, Bermuda, 17pp.

UK P&I Club 1999. Analysis of Major Claims, Ten-Year Trends in Maritime Risk. Thomas Miller P&I Ltd, London, UK, 93pp.

USCG (US Coast Guard) 1997a. Prepared by ICF Kaiser Consulting Group, Inc, Soza & Co Ltd, Marine Research Assoc. The Economic Impacts of Accidents on the Marine Industry. Department of Transportation, Washington, DC, April 1997 (unpublished manuscript) 46pp.

USCG (US Coast Guard) 1997b. The Benefits of Prevention. Department of Transportation, Washington, DC, 10pp.

USCG (US Coast Guard) 1999. Draft ISM Code Study—Steering Committee Report: The status of implementation of the ISM Code. Office of Compliance, Washington, DC, October 1999 (unpublished manuscript).

USDOJ (US Department of Justice) 1998. Royal Caribbean to Plead Guilty to Conspiracy, Obstruction of Justice. Washington, DC, 2 June.

USDOJ (US Department of Justice) 1999. News Release #99-316. Washington, DC, 21 July 1998.

Wiens, John A., E.L. Brannon, J. Burns, R.H. Day, D.L. Garhelis, A.A. Hoover-Miller, C.B. Johnson and S.M. Murphy 1999. Fish and wildlife recovery following the *Exxon Valdez* oil spill. Proceedings of the International Oil Spill Conference, American Petroleum Institute, Washington, DC, pp. 127–133.