Chapter 2

The Need and the Solution

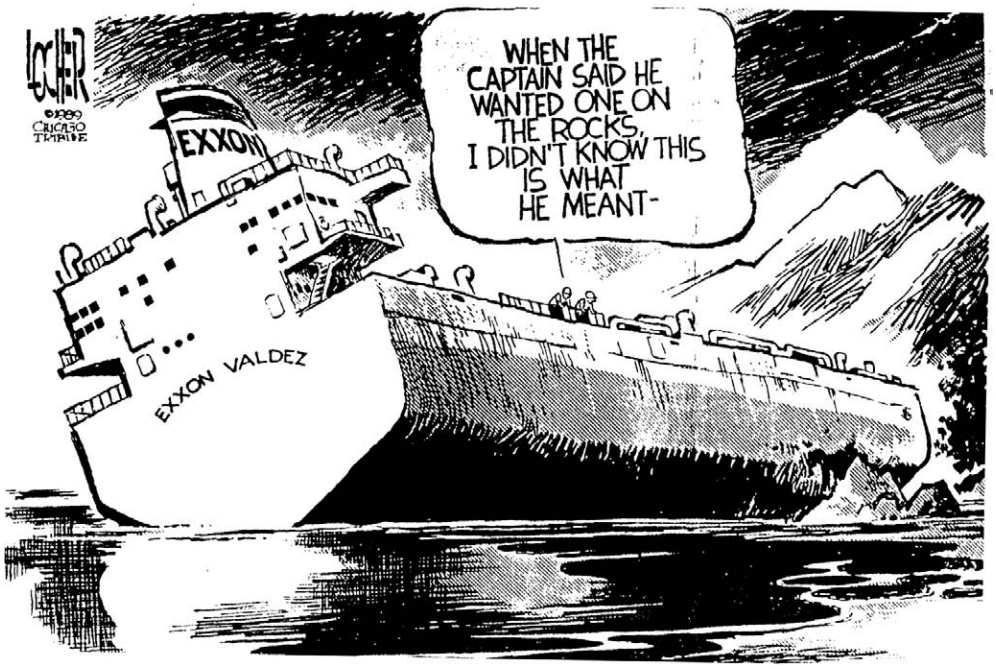
Oil spills are no longer considered an unavoidable "accident" of environmental conditions or a function of a catastrophic event. Human error accounts for 80% of all marine casualties (ITOPF, 1999; Ornitz, 1996; USCG, 1995).*

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

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

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

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



By Dick Locher, *Chicago Tribune*, 1989.

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

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

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

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

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

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

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

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

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

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

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

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

2.1. Prevention Through People—The Human Element

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

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

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

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

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

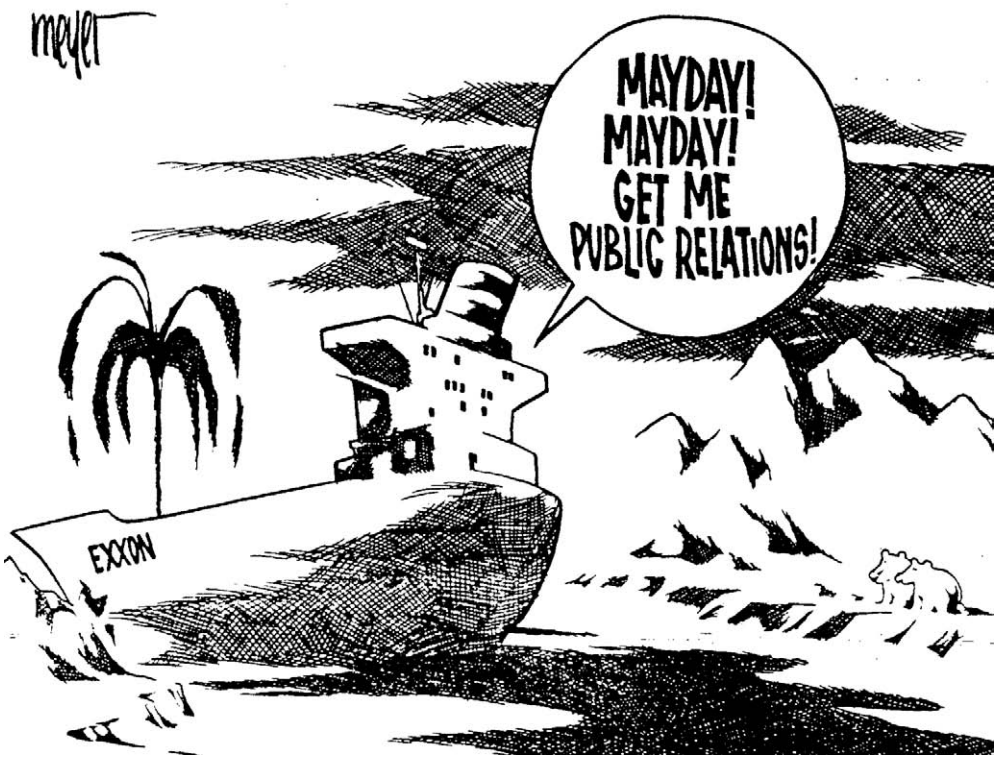
- Rules, regulations and standards affecting vessel specifications and operations;
- Management of vessels;
- Work environment which interfaces with people, machinery and the natural environment;
- Behavior of the people involved; and
- New technology and its impact on how the system functions.

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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

2.2. Oil Spill Response—"Best Response"

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

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

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

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

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

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

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

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

2.2.1. First Factor—The Limits of Liability

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

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

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

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

2.2.2. Second Factor—The Scope of Losses

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

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

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

2.2.3. Third Factor—The Responsible Party

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

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

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

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

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

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

- Identification of the qualified individual;

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

2.2.5. International Regulatory Regime: Fourth Factor

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

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

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

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

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

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

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

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

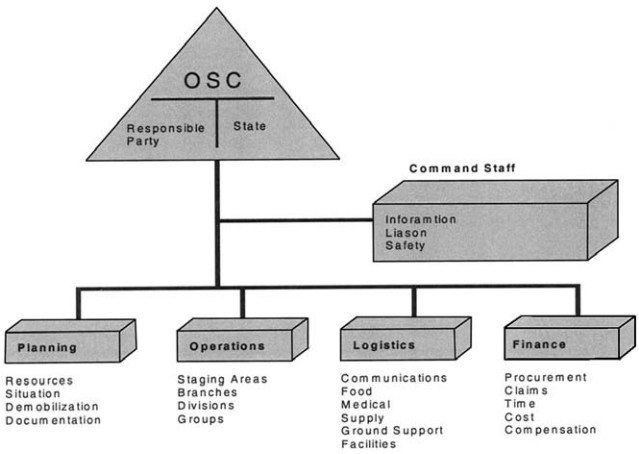


Fig. 2.1. The National Interagency Incident Management System (NIIMS) Incident Command System (ICS) and its organization (Hereth, 1998).

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

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

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

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

In addition:

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

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

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

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

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

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

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

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

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

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

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

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

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

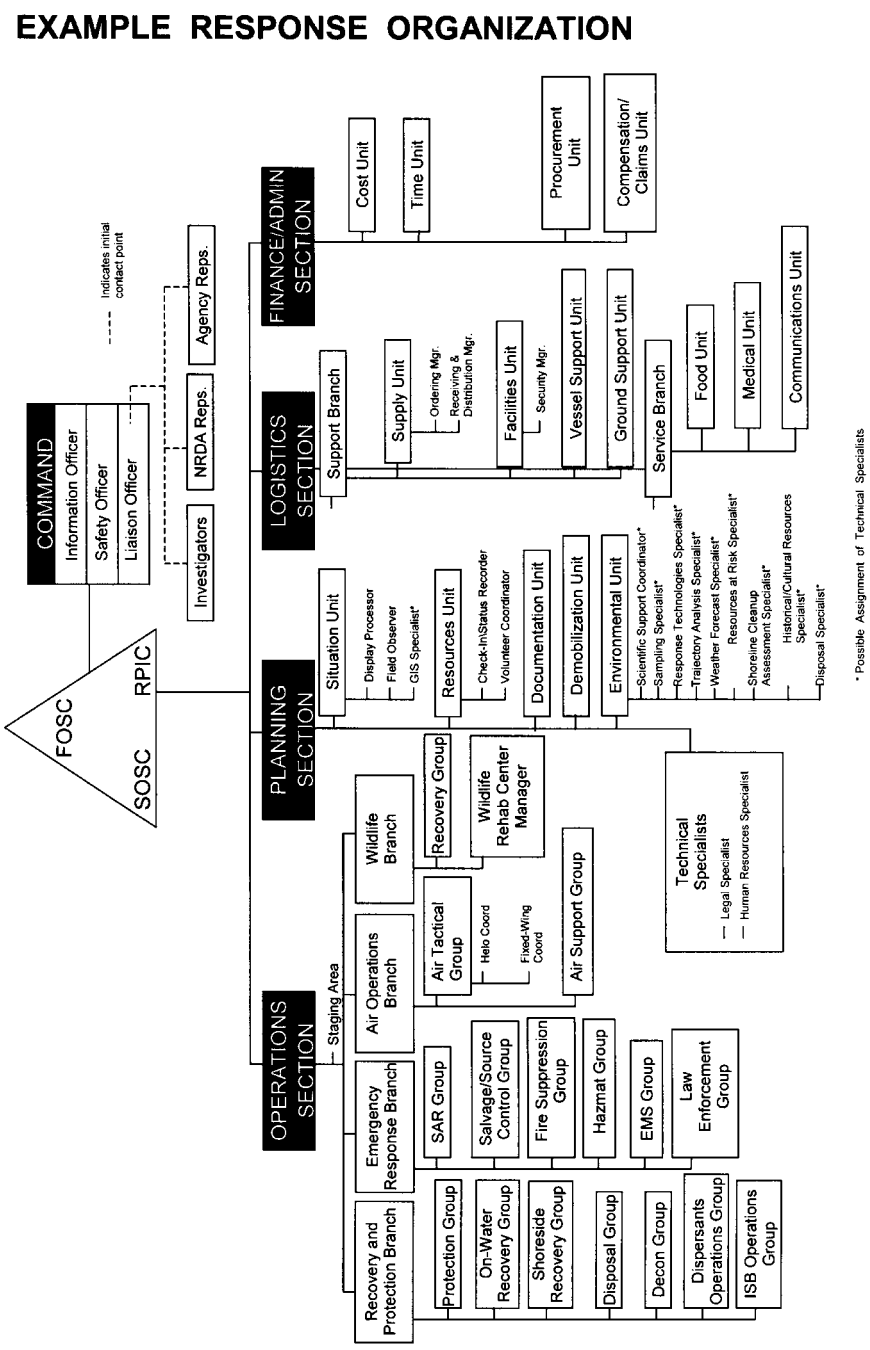


Fig. 2.2. An example of Field Operations Guide Overview of Spill Response organization (from USCG, 2000) [see http://www.uscg.mil/hq/gm/nmc/response/#Guides].

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Major articles of OPRC cover these areas:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

2.4.1. Technical Realities

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

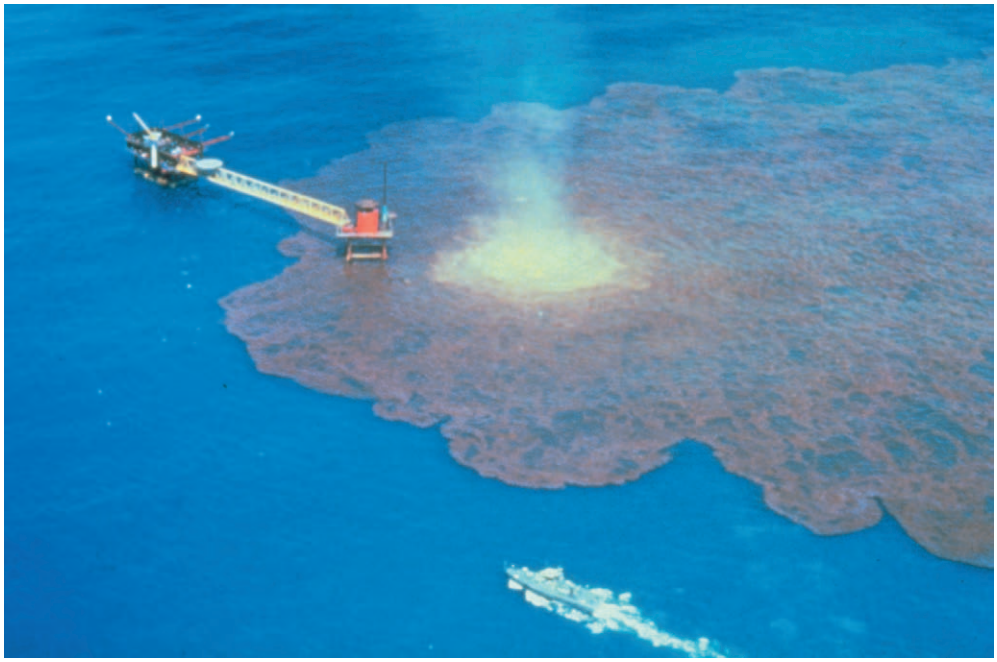
These two points of view show the nature of the debate between the contractors and the spill management teams/qualified individuals and the insurers. At a time when all those involved in response should be coordinating their efforts and functioning at their optimum as a team, such dissension and resulting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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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