SECTION 2

MYTH OR REALITY? HAVE RESPONSE CAPABILITIES TO CLEAN UP LARGE SPILLS IMPROVED OVER THE LAST 20 YEARS?

Over the past 20 years, there has been a tremendous increase in the provision of oil spill equipment in many parts of the world. This section discusses the tiered response concept, together with developments that have occurred in various nations and regions. Evidence is presented to show whether these developments have resulted in increased response capabilities or whether further investment is still needed. Many governments, but more especially the oil industry, ports, and private contracting companies, have increased equipment holdings considerably. Improvements also have been made in contingency planning and spill management but regrettably are not universal. A number of international and bi-lateral agreements have been concluded concerning co-operation among countries in the event of oil spills (Appendix A).

2.1 DEVELOPMENTS BY VARIOUS NATIONS AND RELIGIONS

Within the scope of this paper, it is not possible to quantify the improvements made in every country. Summary information of significant developments in response capability is provided from around the world, concentrating on developed countries that have experienced large spills. In these countries following these spills, national response arrangements have been brought to a relatively high standard.

Africa. Until recently in much of Africa, little work had been done to prepare for spills unless it has been driven by oil company commitment. In some countries, such as Nigeria, there is only a draft National Contingency Plan (NCP). In contrast, plenty of oil spill equipment exists for response in the rivers and Niger delta. A recent spill from the Idoho pipeline (1998) highlighted the shortage of offshore equipment in the region, perhaps stemming from lack of properly developed plans. In Angola, it has been decided only recently which ministry shall be the national response authority, without which there could be no NCP. In other African countries, different national problems may be more urgent, with poverty, collapsed commodity prices, and need to develop the economy and feed and house the population placing oil spill response low on the list of priorities. With few exceptions, it is a myth that response capability has improved in Africa.

Australia. Following the *Kirki* spill in 1991, the Australian National Plan (Natplan) was reviewed completely. The outcomes of that review included the purchase of additional oil spill equipment to be stationed around the coast. In an offshore spill, the use of mechanical equipment alone will not prevent the oil from coming ashore (Purkiss, 1998). In addition, the length of the Australian coastline and often-rough weather conditions preclude mechanical equipment use. Dispersant use is allowed in appropriate situations: for example, aerial application using crop spraying aircraft was used briefly during the *Kirki* spill (Sapelli, 1998). Since then, dispersant use has expanded into the Fixed-Wing Aerial Dispersant Capability (FWADC) (Lipscombe, 1998). A minimum of two crop spraying aircraft, which can carry between 1½ and 3 tonnes (10–20 bbls) of dispersant, are available at 4 hours notice, and other aircraft can be made available with longer notice.

As a result of lessons learned during the *Kirki* and other smaller spills, the Australian spill management system is being upgraded to handle the planning and logistics necessary to mount a major oil spill response. The level of government-industry co-operation has increased, which is considered to be one of the greatest improvements. An integrated national response team has been established, and it includes representatives from government and industry. The team has been mobilised for small spills, such as that from the bulk carrier *Iron Baron* (1995) but has not been tested in a major spill. There is a similar government-industry approach to training. Various courses have been introduced covering all aspects of spill response, and the content and programmes are being developed jointly by government and industry (Lipscombe, 1998). It is a reality, therefore, that response capability has improved over the last 20 years in Australia.

France. France is particularly vulnerable to the risk of oil spills since there is considerable passing tanker traffic to the oil ports of Europe along the Atlantic and English Channel coasts (Holt, 1995). Under the National Marine Pollution Plan (POLMAR), the French Navy is responsible for the cleanup of spills at sea. Since the *Amoco Cadiz* spill, which was caused by a steering gear failure in the vessel and the inability to secure a towline onboard, multi-role tugs have been stationed

in the region permanently and equipment stockpiled for use at sea. The French government also established stockpiles of shoreline cleanup equipment at Brest and Marseilles to support the shoreline response plan. POLMAR is tested during major response exercises conducted in co-operation with the oil industry.

The Centre for Documentation, Research, and Experimentation into Accidental Pollution of the Water (CEDRE) was established to conduct research in spill response techniques, provide technical advice to the French and other national authorities in producing response plans, and form teams to assist with spill responses in France and abroad. Today, CEDRE is respected internationally and frequently assists other countries in planning and response. It is a reality, therefore, that response capability has improved over the last 20 years in France.

Gulf of Arabia. Although there has been much discussion over many years and a large increase in the amount of response equipment in the region, particularly during and since the 1991 Gulf War, there has been little governmental determination to make significant improvements. Few countries have signed any of the compensation conventions: only Oman has signed the International Convention on the Prevention of Pollution from Ships of 1973 with its 1978 Protocol, MARPOL 73/78, and only Iran has signed the International Convention on Oil Pollution Preparedness, Response, and Co-operation (OPRC Convention).

The *Pontoon 300* accident in January 1998 off the United Arab Emirates, when 6,000 tonnes (42,000 bbls) of heavy fuel oil were spilled from a barge smuggling oil from Iraq, illustrates this region's inadequate response capabilities. Poor response was exacerbated because the owner could not be identified. Adverse weather and the general unseaworthiness of the barge also hampered the eventual response. There was a 6-day delay before a belated and largely ineffective response commenced, which would not have occurred if there had been committed, determined government action. Throughout most of the Gulf of Arabia, therefore, it is a myth that response capability has improved in the last 20 years.

Norway. The State Pollution Control Authority (SFT) of the Department of the Environment is the responsible authority for marine oil pollution in Norway. Following a major blow-out from the Ekofisk Bravo oil field in 1977, SFT required offshore operating companies to ensure that response equipment was in place and available for use in an open water response. As a result, the Norwegian Clean Seas Association for Operating Companies (NOFO) was formed to manage this project. At the time, the necessary equipment did not exist to meet SFT's requirements, which gave considerable impetus to developing response equipment for open water response. This development was aided by the Norwegian authorities' willingness to allow oil to be spilled at sea for operator training and developing and evaluating new equipment.

Following the *Exxon Valdez* spill, Norwegian authorities imposed strict response preparedness requirements on Norwegian oil terminals, refineries, and industrial complexes, as well as on local authorities, which resulted in large purchases of oil spill equipment. Vessel traffic and pilot services improved, and the Norwegian Centre for Marine Environment and Safety was established, including a National Test Centre for environmental technology and a National Training Centre for oil spill response. There has been no opportunity to test these arrangements on a major scale. However, it is a reality that response capabilities have improved over the last 20 years in Norway.

The UK. Having suffered three of the world's "top twenty" oil spills — *Torrey Canyon* (1967), *Braer* (1993), and *Sea Empress* (1996) — the UK is aware of what is required in a major spill. Though many years before the period covered by this paper, the *Torrey Canyon* spill must be mentioned since it spurred two international compensation schemes — the Civil Liability Convention (CLC) in 1969 and the International Oil Pollution Compensation (IOPC) Fund in 1971 — as well as major research and development programmes in the UK.

In the late 1970s and early 1980s, the government-owned Warren Springs Laboratory (now the privatised AEA National Environmental Technology Centre, AEA Netcen) tested new low toxicity dispersants and developed aerial application methods. Also in the late 1970s, principally the British Petroleum (BP) Sunbury Research Centre undertook a major programme for containment and recovery equipment. AEA Netcen and CEDRE were responsible for the development of "minimally intrusive" shoreline cleanup methods in the late 1980s. Techniques for use and identification of the limitations of booms to protect coastal estuaries were developed and tested by the Hydraulics Research Establishment (Newman and Macbeth, 1970, 1973). Within the UK, these techniques continue to be used for coastal protection, especially of sensitive areas (Perry, in press).

Major government equipment investment was made in the 1970s and 1980s as well. Following the *Cristos Bitos* spill (BP, 1979), emergency lightering equipment was purchased; aerial dispersant spraying was introduced; and dedicated aircraft were contracted. Notable success was achieved during the *Sea Empress* spill with dispersant being used as successfully as it previously had been used during the *Sivand* (1983), *Phillips Oklahoma* (1989), *Rosebay* (1990), and other minor spills. Limited stocks of government-owned, open sea, mechanical recovery equipment and larger stocks of shoreline cleanup equipment also were purchased.

The development of the UK NCP led to the formation of the Marine Pollution Control Unit (MPCU), which was responsible for the cleanup of tanker spills at sea. The MPCU became the focus for all marine pollution matters, with local coastal authorities assuming responsibility for shoreline cleanup. During the *Braer* and *Sea Empress* spills, the NCP was used successfully. Currently, the plan is being revised to incorporate lessons learned, recommendations from independent post-spill reports (ESGOSS, 1994; SEEEC,1998), two reports by Lord Donaldson (Donaldson, in press; Donaldson *et al.*, 1994), and also the input from a national forum consisting of regulators, shipowners, ports, local authorities, and oil spill response organisations. As a result of these efforts, it is a reality that response capabilities have improved over the last 20 years in the UK.

Following an amalgamation of the UK Coastguard Agency and Maritime Safety Agency into the Maritime and Coastguard Agency (MCA) and the formation of four MCA regions, another plan review is underway that involves the MPCU's dissolution. MCA regions will have responsibilities similar to those of the US Coast Guard (USCG): marine safety, port state control, search and rescue, and marine pollution. At the time of writing, the final plan has not been published; however, the regionalisation proposed in the plan is a concern. Prior to the MPCU's formation, spill response in the UK was conducted on a regional basis, and it did not work. This was the *raison d'être* of a central MPCU, and it is hoped that this lesson will not have to be learned a second time. At best, there will be a hiatus for some time until the new arrangements become effective.

The US. The US NCP contains provisions on which spill response operations are based. The first US NCP was drafted in 1968 and refined through the 1970s and 1980s to the time of the *Exxon Valdez* spill. Under the pre-*Valdez* organisation, an RP was considered to have primary responsibility for the cleanup, with oversight by the USCG, US Environmental Protection Agency (EPA), and relevant state.

Throughout the 1970s to the present, both the USCG and US Navy Supervisor of Salvage (SUPSALV) purchased large stocks of pollution equipment. USCG equipment was purchased to ensure that resources would be available as commercial equipment was being mobilised and to cover any shortfalls in provision by an RP. US Navy equipment was purchased specifically to handle spills from Navy vessels and would normally only be mobilised by Federal On-Scene Coordinators (FOSCs) if they considered that an RP and a contracted Oil Spill Removal Organisation (OSRO) were unable to provide the required resources. The requirement for these resources in non-government vessel spills has diminished as the increased level of commercial equipment required by the Oil Pollution Act of 1990 (OPA 90) has become available.

The US NCP was perceived to have failed in Prince William Sound, Alaska in 1989 (Walker *et al.*, 1995). Prior to the *Exxon Valdez* spill, RPs, federal agencies, and individual states tended to plan independently for responses. When a spill occurred, each found that the others' plans were inadequate or incompatible with its own. The result was confusion and recrimination, creating an impression in the public's eyes that chaos reigned. Urgent action was needed to restore public confidence. OPA 90 was the result. Amongst its many provisions, OPA 90 requires government and industry planners to work together to devise appropriate plans and strategies for response management and operations. Vessel and facility owners are required to produce contingency plans with guaranteed levels of response equipment. The revisions to the NCP require establishing local area government-industry planning committees and programmes of joint exercises (National Preparedness for Response Exercise Program, PREP). This fundamental shift in emphasis led to perhaps the greatest improvement, co-operation between an RP and regulatory agencies. Although it is clear that such a partnership is essential, nowhere else in the developed world is the primary responsibility for conducting oil spill response placed on industry, albeit with the government's oversight. Certainly in Europe, spill management is seen as a government responsibility. The US now has a high degree of preparedness based on regulation, contingency planning, training, and exercises, though there is still a need to increase dispersant acceptability. It is a reality, therefore, that response capabilities have improved over the last 20 years in the US.

General observations on national and regional capabilities. It is a reality that most developed nations and several of the more advanced developing countries have devoted much effort to developing a well-resourced and exercised national plan, and improvements have been made. Unfortunately, there are still too many places where response capabilities are not well organised. In the absence of an effective plan and organisation to support an oil spill response, the provision of large amounts of oil spill equipment can be dangerous, especially if managers do not understand the need for planning and responders do not have sufficient training. It is imperative that equipment purchases are not made unless they are part of a comprehensive spill planning process. Persuasive salesmen have sold inappropriate equipment to well-meaning countries that did not have contingency plans to assist in determining what equipment they required. There may be no management organisation in place to direct equipment use or logistic infrastructure to store and move it to a spill site. Often, there are no trained personnel to maintain and operate it. In too many cases, equipment is unused and not maintained and will remain so until it deteriorates and becomes unsuitable.

Even in what are supposedly well-prepared, developed countries, there is still much to be done. Oil Spill Response Limited (OSRL) often has been asked to make equipment recommendations without an existing contingency plan on which to base purchases (Salt, 1998). Within the past 4 years in the UK, the author has observed locked pollution stores or trailers for which the key is been missing, or in which the oil spill equipment is still in the manufacturers' unopened boxes. At one UK installation belonging to a major oil company, the author observed equipment that had been outdoors for so long that international orange had bleached white and skimmer powerpack doors were rusted shut.

2.2 TIERED RESPONSE

While individual nations and the oil industry have addressed their internal response planning and management concerns, both have opted to rely primarily on oil spill response organisations to supply most of the equipment and manpower necessary to mount a large-scale response. This has led to the evolution of a worldwide response capability best described by the tiered response concept (Table 1). To plan for spills ranging from small operational spills to catastrophic events, the tiered response concept has been promulgated internationally over the past 10 years by the International Petroleum Industry Environmental Conservation Association (IPIECA, 1991). The US adopted a similar approach employing different but functionally equivalent terminology.

TABLE 1.
SYNOPSIS OF TIERED RESPONSE CONCEPT

TIER	DESCRIPTION
Tier 1	Small operational spills at jetties or terminals that are reported to the authorities but managed and cleaned up by the operator. The US functional equivalent is the Average Most Probable Discharge (AMPD).
Tier 2	A larger spill, either at or in the vicinity of a facility, that cannot be handled by the operator alone. The port or local authority will manage it. Personnel and equipment support will be required either from other port users or from a local spill co-operative. The US functional equivalent is the Maximum Most Probable Discharge (MMPD).
Tier 3	A major spill at or remote from a facility that will require the National Contingency Plan (NCP) to be invoked and national resources to be mobilised. Additional support may be required from outside the country under multi-national arrangements. Personnel and equipment may be required from an international Tier 3 oil spill response co-operative. The US functional equivalent is the Worst Case Discharge (WCD).

Source: Adapted from IPIECA (1991).

To avoid duplication of expensive resources that are required infrequently, various co-operative arrangements have been made. Tier 2 facilities have been developed in some major ports. Groups of oil companies have established national or regional Tier 2 oil spill response bases or international Tier 3 bases in strategic locations throughout the world.

Response capability often is measured as a theoretical, numerical cleanup capacity (a total capacity in tonnes of the equipment package or in barrels per day). These capacity estimates can be very misleading since they imply the ability to clean up a specified amount of oil. For example, an equipment stockpile might be rated as having a 10,000-tonne (70,000-bbl) recovery capacity, which is a theoretical figure that may factor in nameplate capacity, downtime, and water pickup under ideal conditions. The actual capability to clean up oil in a real spill situation will depend on many other factors, which are discussed later in this paper.

The concept of co-operative arrangements and establishment of jointly owned response bases have economic merit, particularly for developing countries, especially those where the risk is not great. Such bases also form pools of practical first-hand experience, on which countries that have little or no practical experience can draw. It is anticipated that experienced response personnel would form an important part of international response teams proposed in Section 5.

TIER 1 RESOURCES: OIL INSTALLATIONS AND PORTS

The oil industry has made great efforts to ensure that most industry-owned oil terminals are equipped to handle small spills. As these small spills constitute 92 percent of the total oil spilled from tankers (ITOPF, 1998a), there should be evidence of a marked improvement. Given favourable weather and tidal conditions, it should be possible to deploy equipment rapidly, operate it in pre-determined positions to contain spilled oil close to the source, protect local sensitive areas, and remove oil rapidly. Many ports have Tier 1 response capabilities in place, for example, to respond to bunker spills. The OPRC Convention implicitly requires such response capabilities in facilities, and this requirement will be implemented progressively by national legislation. In the drive for economy, many terminals are short of manpower to handle emergencies. Additional support personnel must be available at very short notice to deploy response equipment, which is not always the case.

TIER 2 RESOURCES: NATIONAL, PORT, AND INDUSTRY

A number of industry-funded national or regional Tier 2 co-operatives have been established where higher risks exist because of oil exploration and production activities or high-volume tanker traffic. Some countries — including Australia, France, Norway, the UK, and the US — have developed national equipment stockpiles (Tier 2) to supplement local Tier 1 resources. Several larger ports also have developed co-operative Tier 2 arrangements to supplement the Tier 1 resources of individual installations within the port. A good example of this is the Thames Oil Spill Control Association (TOSCA) operating within the area of the Port of London Authority in the UK. In the cases reviewed below, most co-operatives are generally well managed, maintained, and operated.

Gulf of Arabia. Oil companies in the Gulf of Arabia purchased large amounts of oil spill equipment. Gulf Area Oil Companies Mutual Aid Organisation (GAOCMAO) was established in 1972 with headquarters in Bahrain. GAOCMAO owns no equipment, but, in the event of a spill, members may request assistance from other companies. This approach is not recommended, as there is no guarantee that a request for assistance will be honoured. Preferably, some equipment should be centrally stored, maintained, and operated. Although there have been increases in equipment holdings, there is some doubt whether mutual support would actually occur.

Hong Kong. There is significant risk from product movement into Hong Kong and also from other shipping in the narrow entrance channel. The oil industry is in the process of establishing a Tier 2 base in Hong Kong. At present, difficulties

in acquiring a suitable site for the base are delaying establishment. It is, therefore, too early to conclude that Hong Kong has been successful in improving response capabilities.

Malaysia. Malaysia has extensive offshore oil production, and there is considerable risk from tanker spills through the Malacca Straits. In 1994, the companies operating in Malaysia led by the state oil company, Petronas, established the Petroleum Industry of Malaysia, Mutual Aid Group (PIMMAG). PIMMAG established large stockpiles of oil spill equipment at three locations (Port Dickson for the Straits of Malacca, Kemaman for east coast Peninsular Malaysia, and Labuan and Miri for Sabah and Sarawak). A full-time team of contractors provides maintenance and a core team of personnel available for deployment to a spill location. Additional industry personnel are trained to supplement this team. The designed response time is 12–24 hours from each stockpile. The equipment resources are designed to have a total response capacity of approximately 20,000 tonnes (140,000 bbls). Malaysia, therefore, has developed suitable equipment capabilities.

Norway. Prior to the Ekofisk Bravo platform blow-out in 1977, SFT produced a very strict requirement for offshore pollution control equipment: equipment must be capable of operating in wave heights of 2.5 metres. When the rules were formulated, this was impossible to achieve with the available equipment; however, oil spill exercises using real oil have been conducted annually to test and evaluate new equipment and train response crews.

Each offshore platform, in addition to its Tier 1 resources, must be able to recover and store 8,000 m^3/day (40,000 bbls/day). Of this amount, 25 percent of the resources must be onsite within 24 hours and the remainder within 48 hours. This is achieved by NOFO, an offshore oil industry organisation that operates five onshore bases from which equipment is deployed. Within the bases, there are a total of 14 oil recovery systems, each with a team leader and three operators. The equipment can be loaded on any of 15 converted rig supply vessels that are classified as oil recovery vessels with onboard storage for 1,000 m^3 (5,000 bbls) of oil. Fishing vessels are available for towing boom. Shuttle tankers are available for recovered oil disposal. As such, Norway has developed suitable equipment capabilities.

The US. The US has the greatest concentration of Tier 2 resources in the world. Even before the *Exxon Valdez* spill, co-operatives had been formed in many parts of the country to support oil industry operations. At the time of *Exxon Valdez,* there were over 90 industry-owned contractor co-operatives in the US, such as the Clean Seas Co-Operative based in California to cover oil production operations in the Santa Barbara Channel.

Other tier 2 co-operatives. Other Tier 2 co-operatives are either forming or in existence: in Alaska, where both Alaska Clean Seas and the Ship Escort Response Vessel Service (SERVS) possess large stockpiles of oil spill equipment; in Thailand, the Oil Industry Environmental Safety Group; in Guam, Guam Response Services Limited (GRSL); and in Korea, Korea Marine Pollution Response Corporation. The increase in oil spill awareness and reduction in oil company staff has provided the opportunity for many private contractors to establish and expand their operations in various parts of the world, and improvements in Tier 2 response capabilities continue to be made.

TIER 3 RESOURCES: INTERNATIONAL RESPONSE BASES

The oil industry has established major co-operative response organisations on a regional basis throughout the world to provide equipment and specialist manpower to reinforce local capabilities in responding to the largest spills.

Australian Marine Oil Spill Centre. The Australian Institute of Petroleum (AIP) established the Australian Marine Oil Spill Centre (AMOSC) at Geelong near Melbourne. AMOSC's area of operation includes Australia, New Zealand, the Southwest Pacific, and Papua New Guinea. The equipment, therefore, is ready to be airlifted at short notice to any part of this large region. The centre has a small staff that is supplemented by oil company personnel during response.

Clean Caribbean Co-Operative. Clean Caribbean Co-Operative (CCC) was formed in 1977 by eight oil companies with a base in Fort Lauderdale, Florida. Since the *Exxon Valdez* spill, it has grown in equipment holdings, contractor staff, and membership. Its primary area of operation covers the Caribbean, which is at risk because of extensive oil movements from Venezuela, Africa, and the Middle East. Coverage recently was extended to all of South America, Central America, the Bahamas, and Bermuda.

East Asia Response Limited. In 1989, a recommendation was made to upgrade the Tier 2 Tiered Area Response Capability (TARC) in Singapore (Stacey, 1989). The recommendation was reinforced by a risk study conducted by oil companies operating in the region. Singapore is located near the major oil shipping route through the Straits of Malacca. It is a large refining and product distribution centre and a hub for air routes throughout the region. By 1994, TARC was upgraded and renamed the East Asia Response Limited (EARL) with a 30,000-tonne (210,000-bbl) stockpile. The designated operational area stretches from the Straits of Hormuz and East Africa in the west to the International Date Line in the east (Irvine, in press).

Fast Oil Spill Team. The French oil industry established the Fast Oil Spill Team (FOST) base at Marseilles airport to cover its particular interests in the countries of the Mediterranean and East Africa, recognising that there could be language difficulties for English-speaking responders in these countries. FOST does not have an offshore oil recovery capability but concentrates entirely on nearshore and onshore cleanup. The operating personnel are drawn from the Marseilles Marine Fire Service.

Marine Spill Response Corporation. After *Exxon Valdez,* the US oil industry supplemented the local co-operatives and contractors with a national organisation. Under the umbrella of the Marine Preservation Association (MPA), the Marine Spill Response Corporation (MSRC) was formed. Approximately $1 billion was invested in five stockpiles of equipment, each with a 30,000-tonne (210,000-bbl) cleanup

capacity. Sixteen dedicated response vessels were built to deploy offshore equipment, and barges were purchased for recovered oil storage. Initial start-up costs and infrastructure maintenance costs, however, were so high that, faced with competition from contractors, MSRC was forced to reorganise into three regions, replace management, relocate headquarters, reduce staff numbers, and supplement its resources with a network of local contractors. The overall response capability, however, was not reduced.

National Response Corporation. The National Response Corporation (NRC) is the second Tier 3 responder within the US. Unlike MSRC that owns most of its resources, NRC relies on a network of subcontractors to provide equipment in the event of an oil spill. NRC had initial difficulties in convincing sceptics of the guaranteed availability of equipment from such varied sources, but as much of the capital equipment was already in place and as the overheads and charges were greatly reduced compared to MSRC, membership grew rapidly.

The NRC and MSRC now form the backbone of large-scale response capability in the US. Both NRC and MSRC are Tier 3 organisations, and although they are dedicated principally to response in the US, overseas response feasibility is being investigated actively.

Oil Spill Response Limited. In 1980, BP consolidated its oil pollution equipment for major spill response at the Oil Spill Service Centre (OSSC) in Southampton, which became a facility for worldwide response with a permanent staff and capacity to respond to two 10,000-tonne (70,000-bbl) oil spills. In 1985, five major oil companies, including Exxon, joined BP and formed OSRL. Their commitment was justified when the OSRL team arrived at the *Exxon Valdez* spill within 36 hours of the call out, the first OSRO on scene from outside the state of Alaska.

Following that spill, OSRL increased its capacity to respond to two 30,000-tonne (210,000-bbl) spills with a mix of mechanical and dispersant technologies. The proportion of offshore mechanical recovery equipment stockpiles was reduced with a commensurate increase in the proportion of nearshore and shoreline equipment. This change reflected one of the key realities of spill response that, despite responder's best efforts, a large proportion of spilled oil is likely to come ashore. The OSRL expansion report (Stacey, 1989) recognised that speed of reaction was essential and improved use of aircraft as a means of rapid equipment delivery should be investigated. Following the OSRL expansion, its membership grew rapidly, and now 26 of the world's major oil companies belong to OSRL.

OSRL is the only Tier 3 base with a worldwide area of operation. With the establishment and expansion of other Tier 3 bases, OSRL principally will be employed its respond to spills in Europe, the former Soviet Union, the Mediterranean, Middle East, and Africa. It will be available to support other bases in the remainder of the world, particularly with trained personnel (Irvine, in press).

Petroleum Association of Japan. The Petroleum Association of Japan (PAJ) has taken a different approach. As one of the world's leading importers of oil, Japan established seven response bases in Japan and five abroad (Ras al Khafji, Saudi Arabia; Abu Dhabi; Port Klang, Malaysia; Singapore; and Jakarta, Indonesia). In a spill, equipment use is free, although it must either be returned in good condition or replaced. Although local contractors maintain the equipment, it is the spiller's responsibility to provide operating staff. None of the PAJ bases contains offshore oil recovery equipment, and they are not prepared for air transport (Salt, 1998).

Tier 3 co-operative specialised capabilities. OSRL, CCC, EARL, and MSRC each have high-capacity dispersant spraying capability, namely the Airborne Dispersant Delivery System (ADDS) pack, available for deployment by contracted Hercules aircraft at short notice. For each organisation, these aircraft also are available for rapid deployment of recovery equipment.

OSRL, CCC, FOST, AMOSC, and EARL have placed particular emphasis on equipment mobility. Equipment has been reduced in size and/or weight and stored in containerised or palletised packages, ready for immediate air transportation. Aircraft self-unloading equipment also has been developed for use at airfields that do not have adequate cargo handling equipment.

2.3 RESPONSE CAPABILITIES CONCLUSIONS

MYTH OR REALITY? HAVE RESPONSE CAPABILITIES TO CLEAN UP LARGE SPILLS IMPROVED OVER THE LAST 20 YEARS?

The answer varies around the world.

It is a reality for certain nations and regions of the world. Many nations, especially those that have experienced a major oil spill, have devoted much effort to developing a well-resourced and exercised NCP. In general, oil spill response capabilities in those countries have improved.

It is a myth for certain nations and regions of the world. There are some areas of the world where there has been very little performance improvement over the past 20 years. Because of either lack of national resolve or resources, the necessary planning has not occurred in many countries. In the absence of such planning, resource and infrastructure improvements are difficult, if not impossible, to achieve. If equipment alone has been procured, then a false sense of preparedness may exist.