PIRINC

Telephone: (212) 867-0052
Fax: (212) 682-4498

Petroleum Industry Research Foundation, Inc.

122 EAST 42nd STREET

New York, N. Y. 10168-0012

DOE/PE/79095--T1

DE92 014908

Transporting U.S. Oil Imports:

The Impact of Oil Spill Legislation on the Tanker Market

Prepared for

U.S. Department of Energy
Office of Domestic and International Energy Policy

under Contract DE-FG01-91PE79095

FINAL REPORT

June 1992

Petroleum Industry Research Foundation, Inc. (PIRINC) has prepared this report under contract to the U.S. Department of Energy's Office of Domestic and International Energy Policy. Its principal authors were Philip J. Rowland of P. Rowland Associates (Principal Investigator) and Cheryl J. Trench, Executive Vice President of PIRINC. W. Thaddeus Miller of Watson, Farley & Williams (New York) contributed legal analysis. Catherine Rosa was responsible for the word processing and production. Co-Project Managers were Lawrence J. Goldstein, President of PIRINC, and Cheryl Trench.

PIRINC, founded in 1947, is a not-for-profit organization that studies energy economics, with special emphasis on oil and gas. It is not a trade association and does not speak for the oil industry, but is internationally known for providing objective analysis of energy issues. PIRINC is supported by contributions from approximately 40 oil companies ranging from major internationals to regional marketers. It provides analysis of energy market developments and policy issues to the Congress and government agencies, the media, and the energy industries. Its publications are available to the public. John H. Lichtblau is Chairman and CEO.

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF ABBREVIATIONS

AG	Arabian Gulf
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COFR	Certificate of Financial Responsibility
COW	Crude oil washing (system)
CRISTAL	Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution
CVM	Contingent Valuation Methodology
DOE	U.S. Department of Energy
DOI	U.S. Department of Interior
dwt	deadweight tons, the carrying capacity of a ship, in long tons
EIA	Energy Information Administration
FWPCA	Federal Water Pollution Control Act of 1972
grt	gross registered tons, a ship's internal volume
ICLL	International Convention on Load Lines
IGS	Inert Gas Systems
ILU	Institute of London Underwriters
IMO	International Maritime Organization
IOTD w/DS	Intermediate oil-tight deck with double sides; mid-deck
ITOPF	Independent Tanker Owners Pollution Federation Ltd.
LOOP	Louisiana Offshore Oil Port
MARPOL	International Convention for the Prevention of Pollution in Ships
MMB/D	Million barrels per day
NAS	National Academy of Sciences
NOAA	National Oceanic and Atmospheric Administration
NOPR	Notice of Proposed Rulemaking
NRDA	Natural Resource Damage Assessment
OPA	Oil Pollution Act of 1990; OPA '90
P&I CLUB	Protection & Indemnity Club
SBT	Segregated ballast tanks
SOLAS	International Convention for the Safety of Life at Sea
TOVALOP	Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution
ULCC	Ultra Large Crude Carrier, a ship over 275,000 dwt
VLCC	Very Large Crude Carrier, a ship over 160,000 dwt

EXECUTIVE SUMMARY

The Oil Pollution Act of 1990 ("OPA") and an even more problematic array of State pollution laws have raised the cost and risk of carrying all seaborne cargo, but particularly oil, into and out of the U.S. This report, prepared under contract to the U.S. Department of Energy's Office of Domestic and International Energy Policy, examines the impact of Federal and State oil spill legislation on the tanker market. It reviews the role of marine transportation in U.S. oil supply, explores the OPA and State oil spill laws, studies reactions to OPA in the tanker and tank barge industries and in related industries such as insurance and ship finance, and finally, discusses the likely developments in the years ahead.

Marine transportation is the lifeline of U.S. oil supply and the number of tankers in U.S. waters is bound to increase.

U.S. waterborne oil imports amounted to 6.5 million B/D in 1991, three-quarters of which was crude oil. Imports will rise by almost 3 million B/D by 2000 according to U.S. Department of Energy forecasts, with most of the crude oil growth after 1995. Tanker demand will grow even faster: most of the U.S. imports and the increased traffic to other world consuming regions will be on long-haul trades. Both the number of U.S. port calls by tankers and the volume of offshore lightering will grow. Every aspect of the tanker industry's behavior is affected by OPA and a variety of State pollution laws.

Unlimited liability isn't a new concept. What's new is the seeming ease with which it may be imposed.

OPA imposed strict, joint and several liability against vessel owners, operators and bareboat charterers in the event of an oil spill. It established limits to liability, but severely restricted the limits' applicability. It strips traditional defenses down to three: an act of war, an act of God, or the act of an unrelated third party. In addition, liability limits do not apply if the spill results from a violation of a Federal regulation or

safety standard. The combination of provisions means that most spills will breach OPA's defenses.

OPA's most difficult provision: it doesn't pre-empt State law, which may be overlapping and conflicting.

OPA abrogated the Limitation of Liability Act of 1851, and specifically left it to the States to enact legislation on oil spills, including prevention and clean up measures. Nineteen States impose strict unlimited liability, and unlike OPA, many impose liability on cargo owners and charterers. Some State regulations are draconian, and compliance with conflicting, overlapping State regulations has become so burdensome, that to date they have caused more shifts in companies' ship deployment patterns than OPA.

Very few companies have pulled out of U.S. trade. Yet.

The vast majority of tanker owners continue trading to the U.S. This is not to say "Business as Usual" rules the day. Some refuse to carry "persistent" oils (effectively, crude oil and residual fuel oil) to mainland ports, and restrict themselves to discharging via LOOP, or lightering or transhipping in the Caribbean. Companies have restructured, and have pulled out of marginal trades. Most of the large oil companies have recommitted themselves to the U.S. trades, and focus their efforts on control of the tonnage they use, either by ownership or by extensive inspection programs for chartered vessels and the establishment of much closer links with independent shipowners.

"Safety first" is the paramount dictum under OPA.

The most visible effect of OPA, so far, is the sea-change in operational procedures, safety provisions, and inspection routines now being implemented in the oil trades. The trend is pervasive, across all company types and all company sizes. Some owners are already touting their radically improved operational and safety systems in marketing their vessels. There are signs of a marked improvement in the quality of tonnage employed in the U.S. trades. Corporate restructuring to limit the assets at risk continues, but the early signs of a flight to quality provides a stark contrast to the fears of many OPA critics who forecast that U.S. oil imports would be carried in inferior ships, by uncaring owners, for unscrupulous charterers. The exact opposite is occurring.

Half of the tankers on order are double-hulled.

OPA establishes a schedule for retiring existing vessels from U.S. trades. The once controversial double hull requirements have been accepted, albeit with some reluctance; half of the tanker tonnage now being built is double-hulled and the proportion will increase in future. It is possible that an alternative, equally environmentally sound, mid-deck tanker might be permitted to enter U.S. trades in future, but this is a long way off. The design was accepted by the International Maritime Organization early in 1992, but none have been built. Necessary Congressional approval for the mid-deck tanker's inclusion in U.S. trades will not come until its now theoretical safety record has been clearly established.

There are more OPA regulatory hurdles to overcome: Certificates of Financial Responsibility, Natural Resource Damage Assessments, and the National Contingency Plan.

Current pollution legislation presents the following major hurdles for the maritime and oil industries:

Certificates of Financial Responsibility are required for vessels trading to the U.S. These demonstrate availability of sufficient means to meet a specified level of claims in the event of a spill. Levels of cover required under OPA are much higher than under earlier laws. Also much higher is the risk that shipowners and providers of financial responsibility will possibly face unlimited liability in the event of a spill. (Cargo owners and charterers may also be at risk). The Coast Guard's proposed rules have caused a storm of controversy, because OPA requires that the guarantor (under the pre-OPA rules, the Protection & Indemnity Clubs that provide insurance) be directly liable for any damages. The Clubs have refused to submit to OPA's higher requirements and defense waivers. If the Coast Guard were to implement the rules as proposed, no ship would likely qualify for a Certificate. A complete stop to U.S. waterborne commerce is unthinkable, however; a solution will be reached.

Natural Resource Damage Assessment proposals, based on an evaluation technique known as Contingent Valuation, threaten to make extraordinarily high claims commonplace -- even after lost incomes have been compensated and resources restored. The theoretical basis for Contingent Valuation is questioned by many in the academic community and the National Oceanic and Atmospheric Administration has sought the advice of a blue-ribbon panel of economists on whether to incorporate the technique in its forthcoming rules.

The potential for operational disruption posed by OPA-mandated contingency plans has been a cause for concern since the Act's adoption. The Coast Guard has convened a second round of meetings of an advisory panel of industry representatives,

State officials and environmentalists, an attempt to assure its rules are workable. The August 1992 deadline for adoption of final rules is thus unlikely to be met.

Re-insurance costs are a problem; re-insurance capacity is a big problem.

Satisfactory levels of pollution liability insurance are hard to come by and very expensive. The capacity of the re-insurance market is currently inadequate for the unlimited liability post-OPA world, and the cost of cover for shipowners has easily trebled in the last two years: it is now one of a shipowner's largest costs. (There is more than adequate capacity to cover the Certificate of Financial Responsibility requirements, if the impasse over direct action could be resolved.)

Although OPA will raise oil transportation costs, fundamental forces in the tanker market will raise them further.

OPA and associated State laws have on average added roughly 6¢/Bbl to the shipowner's cost of importing oil to the U.S. over the last two years. This is not the same as the cost of imported oil to the consumer -- that depends on freight rates, which have been well below levels required to cover full economic cost for years. A double-hulled VLCC currently under construction will require rates equivalent to around $2/Bbl to earn a return on its investment to carry crude from the Middle East to the U.S. This is around 80¢/Bbl above last year's relatively strong timecharter rates. Of that shortfall, approximately 35¢/Bbl will be OPA-induced. Over time, fundamental shipping market forces are likely to raise oil transportation costs more than OPA. And the OPA-induced cost increases are further dwarfed by other increases facing the oil industry and consumers -- "green" product specifications, facilities requirements, etc.

The apparently smooth transition by the tanker owners and the oil industry reflects an act of faith rather than rational acceptance. The U.S. is the pre-eminent source of tanker demand, and it is set to be the biggest growing, in volume terms, during the 1990's. It is rational to expect that tankers will continue to carry oil to the U.S.: there is no conceivable alternative. It is equally rational to expect that at some future point there will be a major, polluting spill in U.S. waters -- despite every precaution being taken. When that happens, under the laws as they currently stand, it is quite possible that the shipowner, and probably the charterer and cargo owner, will be wiped out.

Here is the Act of Faith: the laws are so vague and ambiguous, in many areas, that even when regulations for their implementation are agreed, no one will have a clear idea of the consequences until individual cases land in court. Judges may have so much leeway in interpretation, of damage awards in particular, that the future structure of the tanker industry could be in their hands.

1. INTRODUCTION AND BACKGROUND

Section I. INTRODUCTION

This report, prepared under contract to the U.S. Department of Energy's Office of Domestic and International Energy Policy, looks at the impact of the Oil Pollution Act of 1990 and the developing State oil spill regulations on the tanker and coastal barge markets, and at the implications for the future of the U.S. seaborne petroleum trades.

Our analysis relied on a dual approach. Because much of the legislation, both State and Federal, is still evolving -- particularly with respect to implementing regulations -- as yet there can be no definitive assessment of its impact. Consequently a quantitative analysis of fleets, trades, and vessel movements, was complemented by extensive interviews. Discussions have been held with oil companies large and small, shipowners, charterers, insurance companies, classification societies, and a variety of public and private institutions active in the maritime industry. All interviews were conducted in confidence: no individual views are identified in this report.

Section II. BACKGROUND BRIEF: THE PRE-OPA ERA, 1973-1989

A. *The Tanker Market*

The 1990's promised to be an extremely interesting decade for the tanker market even before the fateful *Exxon Valdez* incident and its dramatic and far-reaching consequences. This section, deliberately brief, paints the backdrop against which any OPA-related changes should be seen.

Figure 1 shows tanker supply and demand paths over the last 20 years. In the early 1970's, virtually unanimous forecasts of steadily rising seaborne oil trades and a drastic increase in the number of shipyards capable of building VLCC's and ULCC's led

to an orgy of shipbuilding. Order books were full in 1973 when OPEC quadrupled the price of oil. Though tanker demand remained surprisingly firm, supply soared. In the five years from 1973 through 1977, tanker demand rose by 13% while supply rose by over 60%, but then, after the second oil price spike in 1979-80, matters got much worse. Over the next 8 years, long-haul shipments from the Middle East plummeted as less distant, non-OPEC oil gained a larger share of the world oil market. Tanker demand fell by 62%, but supply declined by only 22%. In 1985, the tanker fleet totalled 273 million dwt, of which over 100 million dwt was surplus to requirements for the fifth consecutive year.

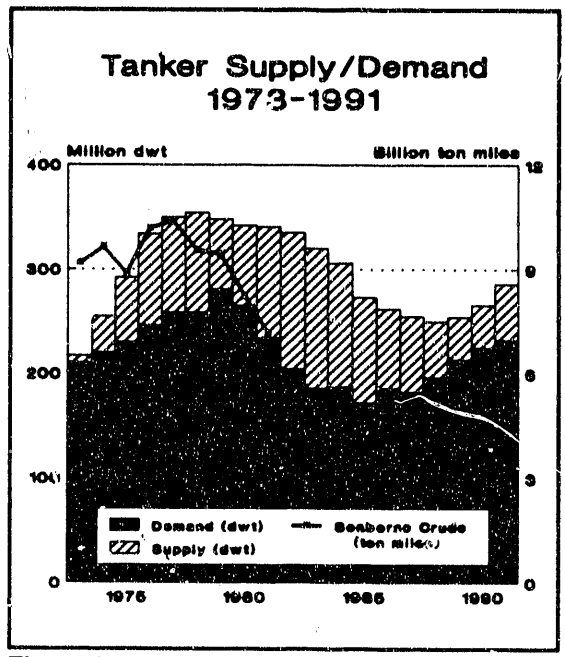


Figure 1

After 10 years of declining tanker tonnage, the trend reversed in 1989 as the growing anticipation of steadily rising U.S. crude imports -- increasingly on long-haul voyages -- fueled the tanker market's first serious bout of optimism in almost 20 years. This was reinforced by the belief that a repeat of the notorious shipping cycle -- massive overbuilding in response to briefly strong markets, followed by years of oversupply and depressed freight rates -- was unlikely. The reason for this belief was that the significant contraction of shipbuilding capacity throughout the 1980's, and the years of unprofitable operations by shipyards, would result in much firmer newbuilding prices that would prove to be an effective brake on over-ordering during the fleet replacement program that had to take place during the 1990's.

The need for a massive replacement program was universally acknowledged. More than 40% of the world's tanker tonnage is at least 17 years old -- a staggering statistic given the widely assumed average life span of a crude tanker of 20 years. By 2000, over three-quarters of existing tanker tonnage will be at least 20 years old, over three-quarters of this will be ships of more than 80,000 dwt. In the late 1980's, shipowners faced a serious dilemma. Newbuilding prices were high, and even a modest return on investment over the life of the ship required freight rates to remain, on average, at 2 to 3 times then prevailing, and historic, levels. The alternative, to buy time, was to invest a relatively modest amount to upgrade existing ships and to extend their trading lives for 5 to 8 years (the "life-extension" approach) in the hope that longer-term investment decisions would be easier by then.

Several other trends deserve brief mention here -- vessel ownership and operation during the 1980's, and the international efforts to govern pollution prevention, maritime safety and ship design.

B. *Ownership and Chartering Trends*

The principal change in ownership during the 1980's was the decline in the fleets of the oil majors. In 1977, when the seaborne oil trade was at its peak, the seven major oil companies owned 20% (70 million dwt) of the world tanker fleet. By 1989, after a decade of restructuring in the oil industry, the six (by then) majors owned just under 13% (30 million dwt) of a greatly reduced world fleet. The share of government-owned ships grew sharply, accounting for approximately 15% of the total, compared with less than 3% at the beginning of the decade. Producing governments -- the new majors -- were the primary movers here. The independently-owned tanker fleet experienced a decline in tonnage similar to that of the oil majors, but the independents retained more than 50% of total world tanker tonnage.

The end of the decade saw a flurry of speculative ownership in the independent sector. The over-riding objective of this type of ownership, typified by the Norwegian K/S partnerships (companies established to encourage outside investment in shipping primarily by offering generous tax incentives), was to profit from buying and selling ships; operating profits were incidental. The uncertainty prevailing in the tanker market in the late 1980's, due to the potential for severe supply disruptions in the 1990's, encouraged such speculation. It also encouraged a new look at the advantages of term chartering amongst those whose livelihood depended on the transportation of oil.

A radical shift in chartering priorities accompanied the ownership changes in the 1980's. In 1977, spot chartering accounted for less than a quarter of seaborne oil movements; ten years later it accounted for more than half. Over the same period oil traders became important shippers of oil: the proportion of oil moved by traders rose from only 2% in 1980 to a peak of approximately 30% in 1987. But oil producing countries, and some of the majors, were looking to secure a supply of future tanker tonnage, and that suggested that the role of tankers was beginning to turn full circle: that they could become an integral part of a producer's distribution or refiner's supply system once more.

C. *Pollution Laws*

U.S. oil pollution and liability laws date back to the Oil Pollution Act of 1924. International laws were first drawn up following the grounding of the *Torrey Canyon*, which spilled 120,000 tons of oil off the English Coast in 1967. International agreements are established through the auspices of the International Maritime Organization ("IMO"), the U.N. agency responsible for maritime safety and environmental protection of the seas, to which all the major shipping nations belong.

Ship design and pollution prevention is governed primarily through three IMO Conventions:

- SOLAS: the International Convention for the Safety of Life at Sea (the 1974, and its 1978 Protocol), which addresses ship safety features for ships and crews.

- MARPOL: the International Convention for the Preventions of Pollution from Ships (1973, and its 1978 Protocol), which addresses structural and operational provisions for tanker pollution control.

- ICLL: the International Convention on Load Lines (1966), which establishes the deepest draft to which a ship can be safely loaded.

These Conventions had prevention in mind. Their design and operational requirements have been widely endorsed, if slowly implemented. Efforts to establish internationally acceptable liability and compensation procedures have been less successful.

The IMO's 1968 Civil Liability Convention ("CLC") and 1971 Fund Convention came into force between contracting nations in 1975 and 1978 respectively. After the *Amoco Cadiz* spilled 220,000 tons of crude off (and on) the French coast in 1978, Protocols -- amendments -- to the CLC and Fund Conventions were drafted, with the aim of raising available limits of liability coverage. The U.S., though it played a key role in drawing up the Protocols, never endorsed them, and consequently a rift developed between the U.S. and much of the rest of the world's maritime community on pollution compensation and liability issues.

~~~~~~
~~~~~~

That was where things stood in 1989 when the *Exxon Valdez* ran aground. There has been little change in the market fundamentals since then. Fears of a shortage of world shipbuilding capacity have eased, but the two basic forces -- rising demand and a very old fleet -- remain.

So does the shipowners' fundamental dilemma. In order to make a 10% return operating a VLCC ordered in 1992 from a Japanese or Korean shipyard, freight rates of around $50,000/day are required over a 12 - 15 year investment period. One-year time-charter rates for a new ship averaged less than half this rate in 1991 and 1990, and were significantly less in 1989 and 1988. Towards the end of the first quarter of 1992, VLCC spot rates touched a 10-year low of $5,000/day. But the dilemma now has an added twist. If deciding whether to invest $100 million or more in a 15-year project wasn't difficult enough, owners must now decide whether they want continued access to U.S. crude trades and, if so, how to build and operate under the strictures of the extremely stringent Federal and State oil pollution legislation. The various factors affecting these decisions are explored in detail in the following Chapters.

2. THE ROLE OF MARINE TRANSPORT IN U.S. OIL SUPPLY

Marine transportation is the lifeline of U.S. oil supply. With its growing net import position, the U.S. must accept continued dependence on tankers. Tankers also carry product exports, of course, a critical component in balancing supply and demand efficiently. Furthermore, tankers and/or tank barges distribute oil along the coasts and on inland river systems. This Chapter reviews these contributions and, using the Energy Information Administration ("EIA") forecast as a base, discusses their outlook.

Section I. WATERBORNE OIL IMPORTS

A. *Historical Trends*

U.S. waterborne imports of oil increased sharply in the late 1980's, after a dip in the early part of the decade when the success of infill drilling kept U.S. production high and the price increases of 1979-80 kept demand low. From a low of 4.5 million B/D in 1983, waterborne imports had increased to 7.1 million B/D by 1989. The high prices in the Autumn of 1990 as the Persian Gulf conflict played itself out combined with sluggish economic activity to dampen imports. In 1990, the average fell below the 1989 level. While prices rapidly declined in early 1991, the

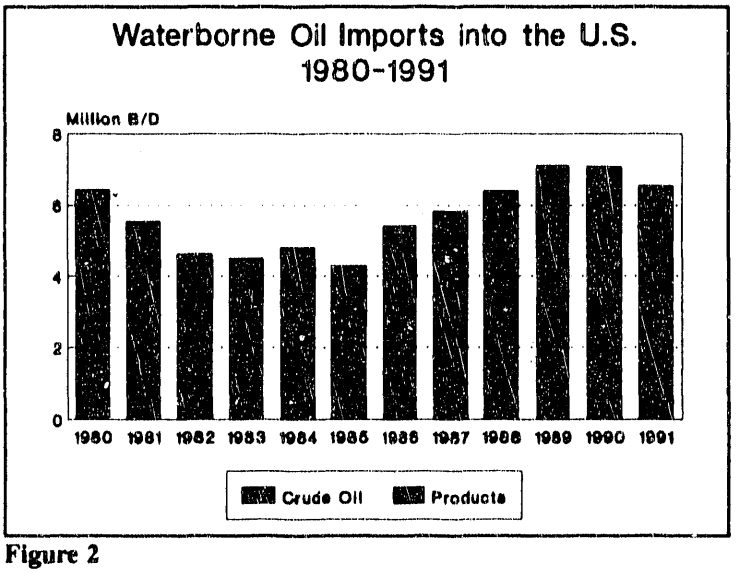


Figure 2

economic recovery remained just over the horizon, so demand, and hence imports, fell again in 1991. See Figure 2.

During the 1980's and into the 1990's, the source of U.S. imports shifted away from, and then back to, the long-haul Middle East suppliers. The pro-rationers of world production during the market tests of the early 1980's were first the OPEC nations, and finally, Saudi Arabia. Imports from OPEC at their nadir, 1.9 million B/D in 1983, were only 30% of their late 1970's peak. Middle East/Saudi Arabia bore the brunt of the decline, with a steeper and longer fall. By 1985, U.S. imports from Saudi Arabia were less than 200 thousand B/D, 12% of their prior 1979 peak. (The 1991 level outstripped this old high point, as discussed below).

The mix of product imports has shown a new trend in the last decade. The traditional product import was low-valued residual fuel oil coming to the East Coast from Caribbean refineries. But demand for residual fuel oil has fallen since the late 1970's, and imports have fallen to a small share of their early 1970's peak. In 1981, imports of residual fuel oil and other "dirty" products totalled about 775 thousand B/D, 60% of all product imports. By 1991, dirty products, at 440 thousand B/D, accounted for only 30% of the product total. The East Coast now accounts for 60% of all clean product imports, including supplies from the U.S. Virgin Islands. The region accounts for 90% and more of the imports of main finished products; other regions import a greater share of unfinished oils for further processing at refineries.

B. *Imports in 1991*

In 1991, the United States imported a total of 7.4 MMB/D, 6.5 of it waterborne. Crude oil accounted for more than three-quarters of the waterborne imports, with the Middle East providing the highest regional share of crude oil and trans-Caribbean shipments dominating product imports.

The Energy Information Administration's country-of-origin data discussed in this section have been divided into tanker routes, rather than the conventional continental or political splits. Supplies from Venezuela, Mexico, the Caribbean Islands, and Central America are put together as "Trans-Caribbean." "South America" excludes Venezuela for this purpose. All of the countries ringing the Mediterranean or with access to it are combined: North Africa, southern Europe, etc. Imports from the former Soviet Union are heavily weighted (more than 90%) to unfinished oils originating from the Black Sea, and are thus included in "Mediterranean." The "Mediterranean" numbers have also been increased, and "Middle East" numbers decreased, to reflect shipments from the Middle East which transit the Suez Canal or the SUMED pipeline. The U.S. receives a relatively small share of these Red Sea supplies, primarily clean product shipments to the U.S. East Coast. The volumes of crude transshipped through the large terminals in the Caribbean are shown in the data as their actual country of origin.

1. Crude Oil

As shown in the following graphs, the Middle East, the longest haul source, provided more than one-third of waterborne crude oil imports. The region's contribution was dominated by Saudi Arabia; supplying 1.7 MMB/D to its own Star Enterprise (which accounted for one-third of the total), as well as other refiners, it provided virtually all of the crude oil imported from the Middle East in 1991, and was the largest individual supplier of crude to the U.S. See Figure 3.

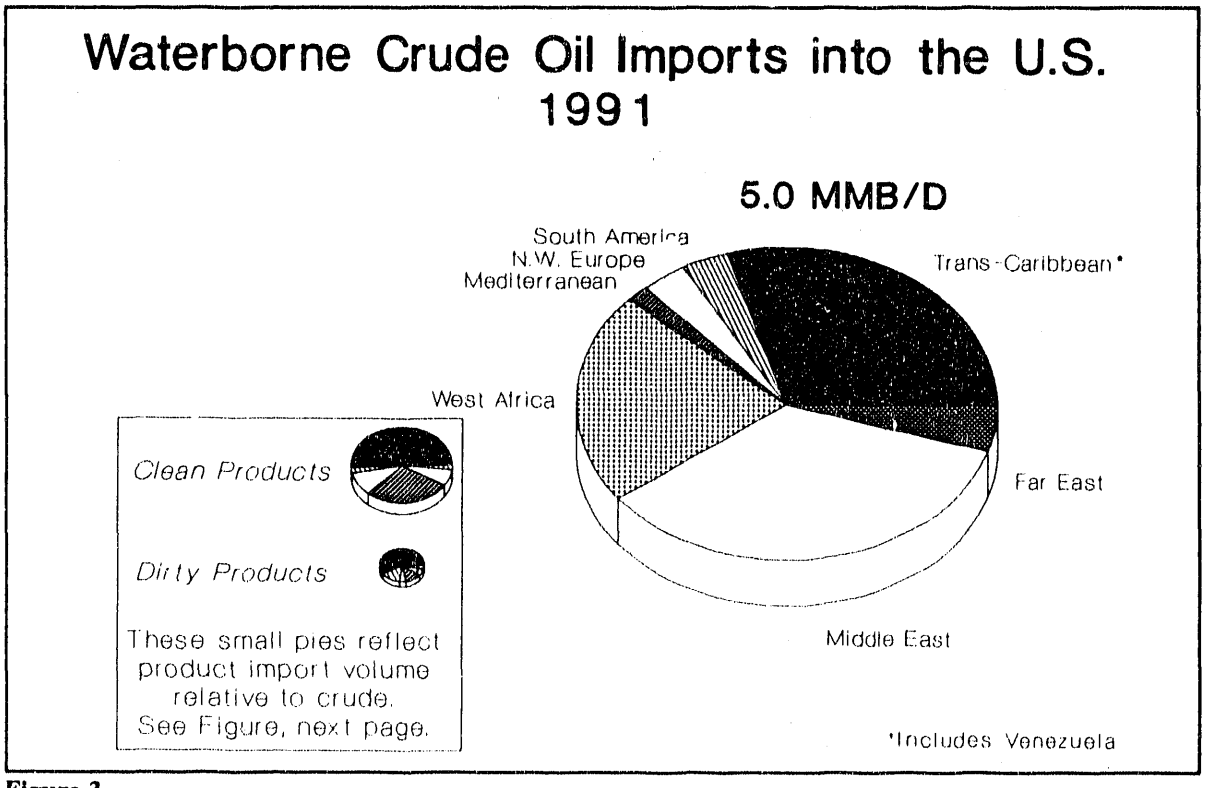


Figure 3

Of course, the Middle East's exports to the U.S. were constrained throughout 1991 by the Iraq/Kuwait conflict and its aftermath. In its last six months of exports, Iraq supplied about 700 thousand B/D of crude oil to the U.S., well above its historical rate. (In 1988, for instance, Iraq exported less than 350 thousand B/D to the U.S.) Kuwait's crude oil supplies to the U.S. also boomed in the very late 1980's, quintupling from less than 20 thousand B/D in 1984-86 to more than 100 thousand B/D in 1987-89. UN sanctions continue to prohibit Iraq's oil exports as of this writing, and Kuwait's oil facility restoration is far from complete. Kuwait's second quarter 1992 crude oil export capacity is some 1 MMB/D, and it plans to reach 1.5 MMB/D by the end of 1992 if it encounters no technical/material delays. Both nations will eventually be fully re-integrated in oil markets. Dependence on the Middle East will rise when each of the producers is back on line, and the overwhelming dominance of Saudi Arabia will decline. As discussed

later in this Chapter, in the long term, dependence on the region will rise further, a reflection of the Middle East's geological pre-eminence.

U.S. also receives significant crude oil supplies from short-haul sources: Mexico and Venezuela rank second (at 760 thousand B/D) and fourth (660 thousand B/D) among countries supplying waterborne crude. Big buyers of Venezuela's crude oil are its joint venture refineries designed to run on these low gravity feedstocks: Citgo, Champlin and Uno-Ven, which together account for one-half of U.S. crude imports from Venezuela. Mexico's customer base is somewhat more disparate than Venezuela's, with its largest purchaser, Chevron, accounting for less than 20% of the 1991 total. These two nations dominate waterborne crude oil imports originating in the Western Hemisphere. The next largest supplier in the region, Colombia, provides less than one-fifth its neighbor's volume to the U.S. Nigeria's light, sweet crude oil, whose trans-Atlantic voyage is short-haul in tanker terms, maintains its traditional role as a key supplier, the third largest in 1991.

These four nations -- Saudi Arabia, Venezuela, Nigeria and Mexico -- together provided about three-quarters of the U.S. waterborne crude oil imports in 1991.

2. Product

As they have for decades, trans-Caribbean shipments (including Venezuela) dominate the product import trades; the region supplied half of all clean products and almost 60% of all dirty product imports in 1991. It is clear that the area will maintain its role. The Amerada Hess refinery on the U.S. Virgin Islands has its natural (and integrated) market on the U.S. East Coast; Venezuela, with a long history of supplying U.S. product demand, has made clear in its refinery investment plans that it will continue to meet more stringent U.S. quality specifications. See Figure 4.

The Mediterranean also supplies significant product volumes. Algeria, for instance, is almost alone in providing non-utility customers in the Northeast with low pour low sulfur residual fuel oil for steam generation. We have also credited some clean product shipments out of Yanbu, Saudi Arabia, to Mediterranean trade as mentioned above. Another component is Algeria's supplies of unfinished oils and petrochemical feedstocks.

Clean products, at 1 MMB/D, account for 70% of all waterborne product imports, and as noted, the largest category is unfinished oils, at just under 400 thousand B/D. The big consumption products, gasoline (with imports of 225 thousand B/D) and distillate (145 thousand B/D), take up much of the remainder. Finished product imports continue to be most important for the traditional product-short region, the East Coast. Unfinished oils, of course, also go to the primary refining region, the Gulf Coast.

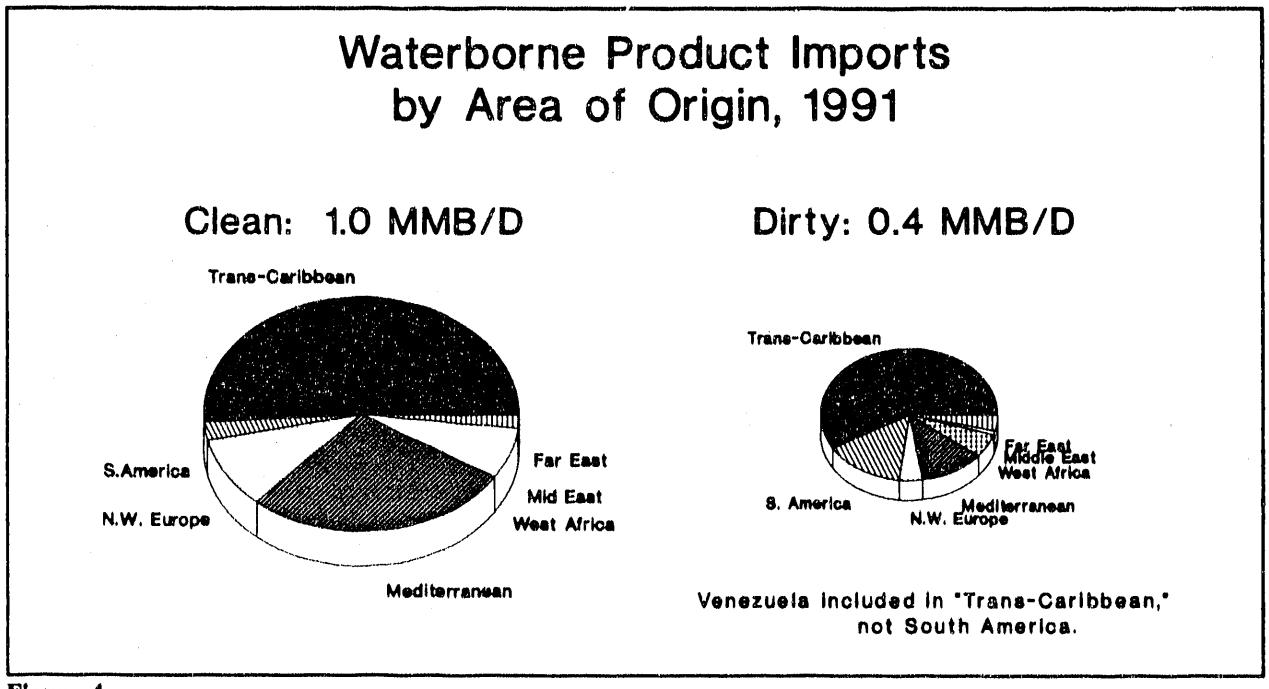


Figure 4

Section II. WATERBORNE EXPORTS

A. *Historical Trends*

The United States has of course not been a net exporter of oil for generations, and will not be again. Product exports have been rising rapidly since Federal controls were lifted in 1982. Amounting to 260 thousand B/D in 1980, the year before price and allocation controls were lifted, they doubled to 580 thousand B/D in 1982 when export controls were eased, and in 1991, were 885 thousand B/D. See Figure 5. Until the late 1980's, exports of surplus high sulfur residual fuel oil from the West Coast were the only important component. Recently, supply-balancing exports of light products out of the Gulf Coast have grown.

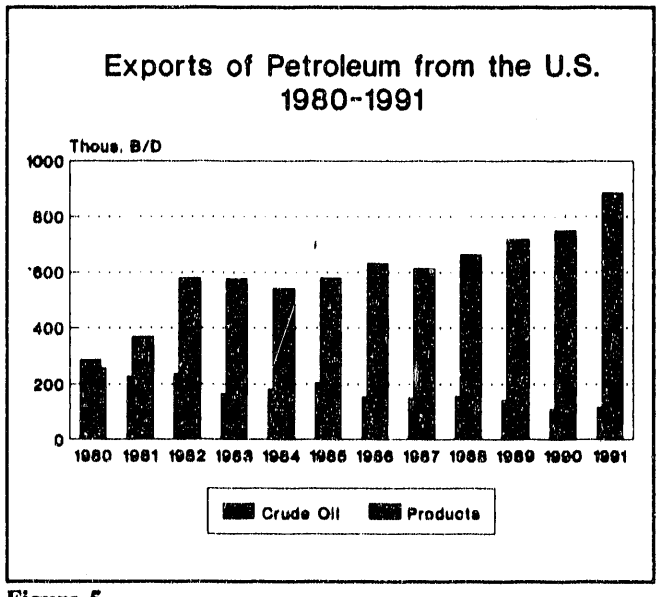


Figure 5

Crude oil "exports," never decontrolled, appear to decline because of shifting trade exchanges with Canada. Crude shipments to the U.S. Virgin Islands, classified as exports, have run at 110-125 thousand B/D throughout the period. The only actual export of U.S. crude oil was the special regulatory exception provided to production from Cook Inlet in southern Alaska, which amounted to about 15 thousand B/D before availability and logistics changes made the deal uneconomic. The contract with Chinese Petroleum Company of Taiwan was not renewed in 1991. (Limited exports of surplus California crude oil are also currently allowed, but no firms are taking advantage of the eased restriction.)

The reasons for increasing product exports will remain throughout the 1990's: the globalization of world oil markets. Product exports are induced by economics -- regional prices reflect the regional supply/demand balance; exports obviously offer the opportunity for the market to correct. Electronic pricing information and worldwide futures markets have quickened price discovery, instantaneously transmitting price signals throughout world markets. The refiners' rapid response around the world has increased the efficiency of the oil market, and in the highly competitive refining environment ahead, companies will have to continue to maximize those efficiency gains.

B. *Product Exports in 1991*

Excluding the shipments to Canada, product exports reached 770 thousand B/D in 1991. The Persian Gulf conflict was a contributing factor to the large boost over 1990, as Kuwait-dependent consuming markets jostled for product imports. These consuming areas were hit doubly hard -- they had to scramble for crude oil to fill their refineries, and had to increase utilization to make up for lost product, but the local refineries did not match the sophistication of the shuttered Kuwaiti facilities, leading to a heavy fuel oil surplus in regions like the Far East. Europe and the Caribbean, too, bid supplies away from other areas. For the first time, the U.S. was a net exporter of distillate fuel oil on an annual basis.

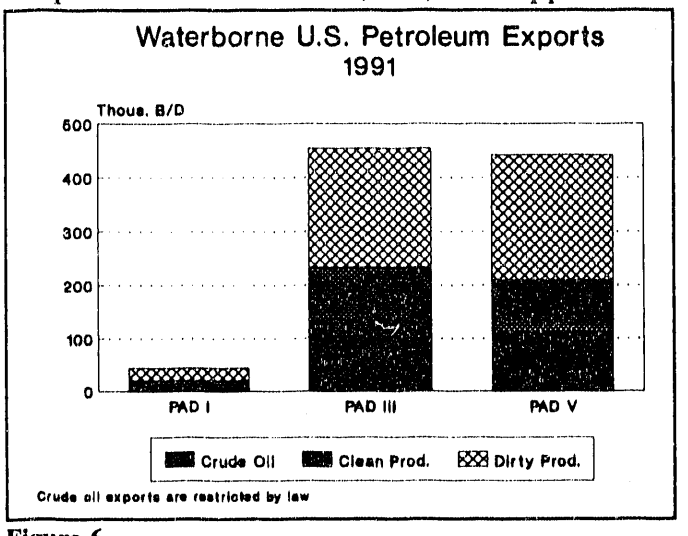


Figure 6

PAD III and PAD V are significant export regions. Excluding PAD V's "exports" of Alaskan North Slope crude oil, to the Virgin Islands, however, we see that the Gulf Coast dominates the clean product trade. Clean product exports from the region increased to 235 thousand B/D in 1991, from its already dominant base of 150 thousand B/D in 1990. PAD V exports of clean products doubled in 1991, but remained less than 100 thou-

sand B/D. Dirty product exports from the Gulf Coast rose substantially, while the West Coast, facing the Far Eastern glut of residual oil, had unchanged dirty product exports. Dirty product continued to account for almost 60% of the product export total, a share eroded by the 1991 surge in clean product exports. See Figure 6.

Figure 7 shows the destination of U.S. product exports: the Far Eastern market for the West Coast's residual fuel oil, for instance. Looking at 1991 alone, however, gives a skewed view of historical trends: the "Trans-Caribbean" region, a relatively small recipient of U.S. exports in 1990, absorbed the greatest increase in shipments of both clean and dirty products in 1991, taking 75% of the clean product increment, and "all" of the dirty products. (In fact the Mediterranean region took lower volumes of dirty products in 1991 than in 1990, leaving room for an increase in exports to the Far East as well.) While exports in total are here to stay, it is not clear that the short-haul regions will remain as significant as in 1991, in spite of Mexico's new steady demand for U.S. product.

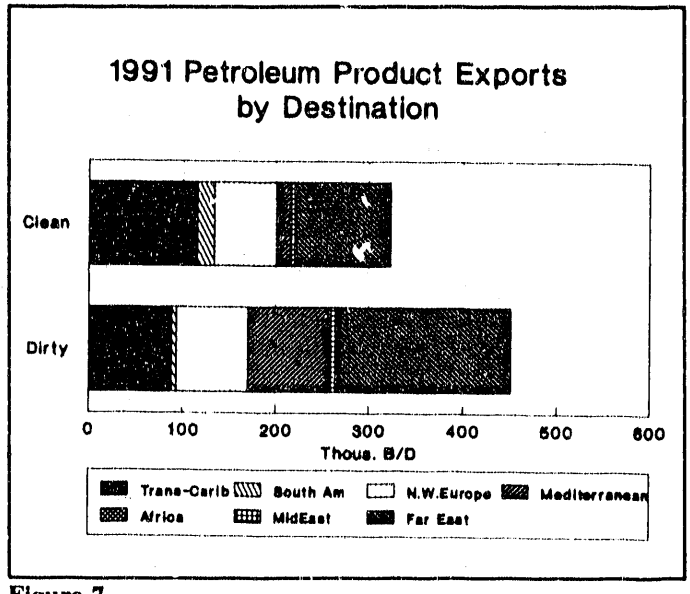


Figure 7

Section III. WATERBORNE OIL MOVEMENTS WITHIN THE U.S.

In addition to the highly publicized (and politicized) import traffic, oil is carried in tankers and tank barges between and within U.S. ports. The movements between PAD Districts, at 830 thousand B/D in 1991, is only a share of the total volume moved. Within PAD Districts, barges ply the waters along the East Coast, carrying both imported and domestic product, and along the Gulf Coast.

The Merchant Marine Act of 1920 (Jones Act) requires that all transit between U.S. ports be in U.S.-built, U.S.-flag vessels. The largest ships and greatest capacity carry Alaskan North Slope crude oil from Valdez to the West Coast and to Panama for transit to the Gulf Coast. (These Alaskan shipments to the Gulf Coast comprise the only significant inter-PAD waterborne crude oil movements; the shipments from Valdez to the West Coast remain within PAD V.) Smaller tankers and tank barges move product along the coasts.

A. *Waterborne Shipments between PAD Districts*

Pipelines are the first choice of oil transporters, since they are cheaper, and now, present less risk. Most oil movements from refining to consuming districts or from coastal to inland areas are by pipeline. Tankers, and to a lesser extent, tank barges, are used where pipelines are unavailable, or to transport heavy oils that cannot be pipelined, like residual fuel oil. Waterborne inter-PAD movements, 835 thousand B/D according to Energy Information Administration data, accounted for just 15% of total flows of oil between PAD's in 1991. The Gulf Coast's refineries are the largest source of product and the consuming regions in the East Coast and the Midwest are the big recipients of the inter-PAD trade.

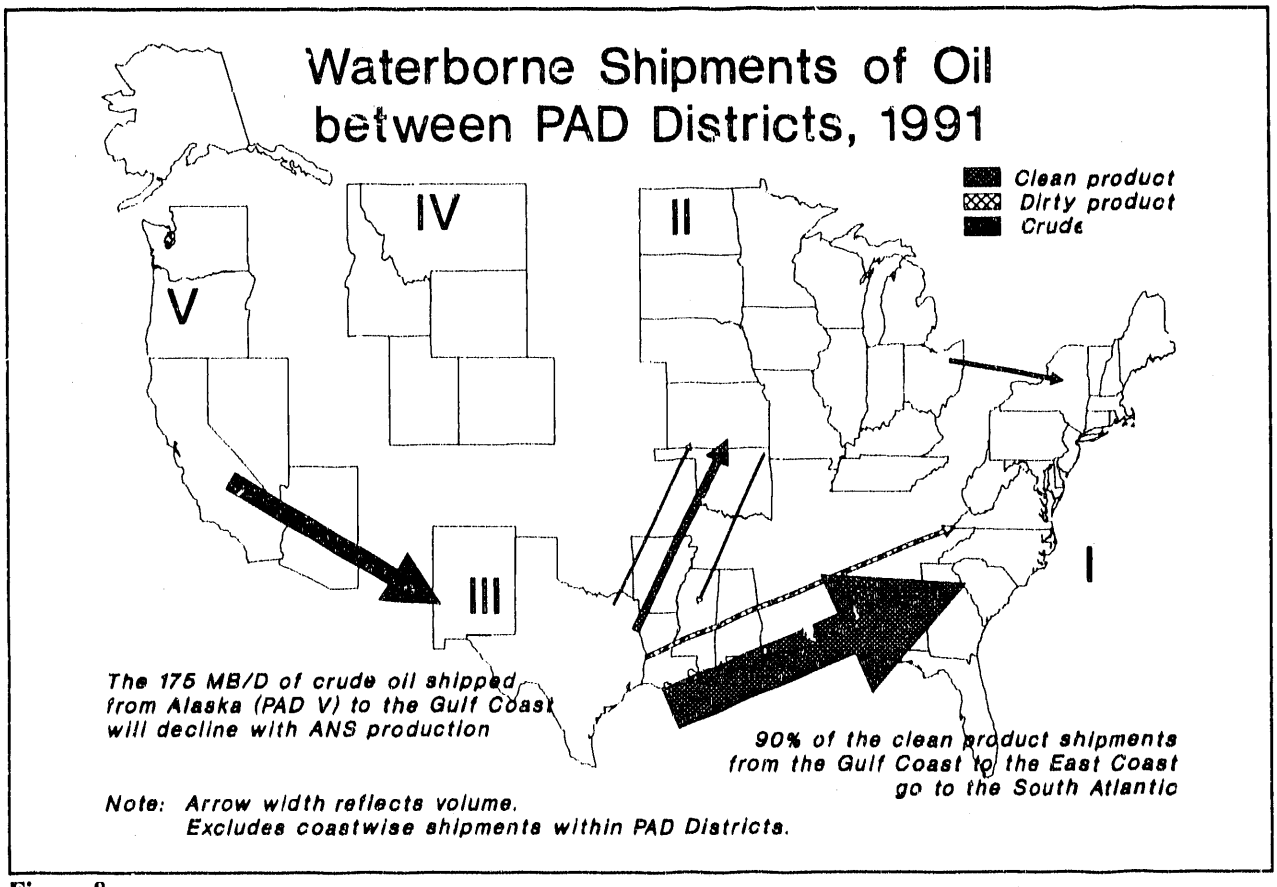


Figure 8

As shown in Figure 8, the only major waterborne movements of crude oil between PAD's is Alaska's North Slope crude oil moving to the Gulf Coast. At 175 thousand B/D in 1991, it is past its peak. In future years, declining Alaskan production will shrink the West Coast surplus. (There are also pipeline shipments of Alaskan crude across the Southwest from California, not shown here.)

By far the largest waterborne product shipments between PAD's is the 415 thousand B/D of clean product going from the Gulf Coast to PAD I. These shipments, which are two-thirds gasoline, go primarily to Florida (Atlantic and Gulf Coasts) and other southeastern states. This Gulf Coast-East Coast traffic accounts for three-quarters of all the clean
product movements, and all of the coastwise movements between PAD's; the other inter-PAD movement are by inland barge, along the Mississippi or other river systems.

Waterborne shipments of dirty product out of PAD III to PAD I, 50 thousand B/D as reported by EIA,[1] constitute a small share of the total inter-PAD coastal traffic, about 10%. An additional 50 thousand B/D of dirty product moves between PAD's II and III, via inland barge.

B. *Coastal Tank Barge Traffic*

According to Army Corps of Engineers data for 1989, the latest available, tank barges carried a total of 3.8 million B/D of product in 1989, of which 2.4 was clean. Inland barges carried about half of this total on rivers and river systems. Coastwise movements accounted for 30% of the clean product total and less than 20% of the dirty product total. Tank barges are critical in Atlantic Coast petroleum trade, where they carry more than 90% of the domestic-origin waterborne cargo. Tankers, however, dominate trade on the other coasts, carrying more than 80% of the Gulf Coast movements of petroleum and virtually all of the West Coast shipments.

The contribution of the tank barge industry to coastwise oil product movements is not readily apparent from EIA data. The Army Corps of Engineers record data for all waterborne commerce in the U.S. and completed a special compilation of its 1989 data (the latest available) for PIRINC, detailing barge shipments of petroleum products in the East and Gulf Coasts, shown in Figure 9. Arranged by Army Corps of Engineers' District, the data include all ports along each coast. The data are not additive across Districts, since a receipt in one will be a shipment from another, but double-counting has been eliminated within the District. Furthermore, a small share of the traffic shown for the Gulf Coast Districts will have been destined for the East Coast, and hence would be reflected in the kind of EIA inter-PAD transfer data discussed above.

The region with the greatest traffic is the Gulf Coast, where tank barges distribute the regional refineries' output. The New Orleans and Galveston Districts each had 800-900 thousand B/D of traffic, 35-40% of which was in dirty products. The share of dirty products at the Gulf Coast is not echoed in the import-dependent Northeast. In New

[1] Market intelligence indicates that the EIA's data may understate shipments of residual fuel oil between the Gulf Coast and the East Coast in spite of EIA's validation efforts. The missing flows would all be waterborne.

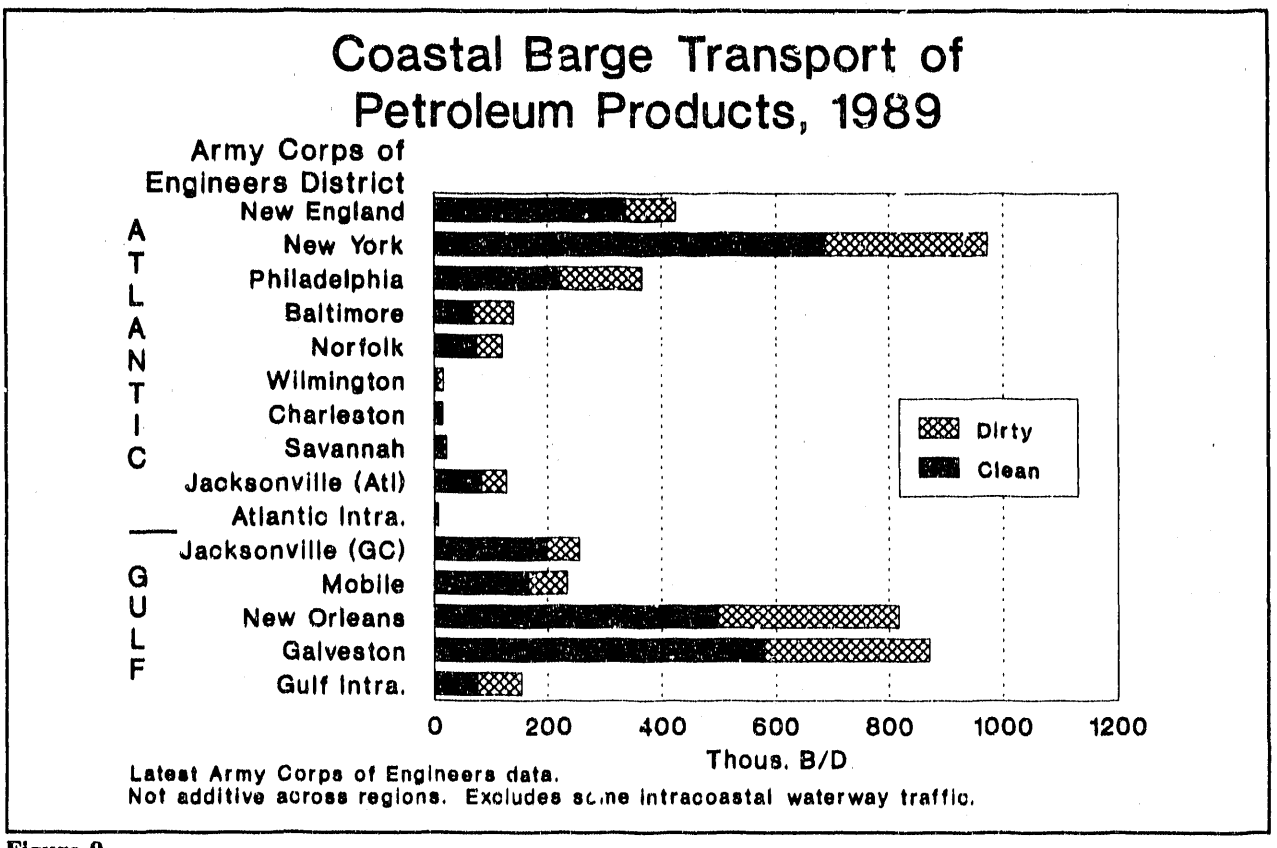


Figure 9

England, dirty products accounted for only 20% of the barge traffic, and in the New York District, for less than 30%. Tankers from abroad supply regional needs directly to deepwater terminals where trucks distribute it further. (Independent conversations with the pilots and port authorities in the largest Northeastern ports confirmed the importance of tanker traffic in port totals.) The Philadelphia District, the only significant refining area on the East Coast, has a share of dirty product traffic approaching the higher Gulf Coast numbers.

The New York District is the most active, moving almost 1 million B/D of product, reflecting its location at the end of the pipeline from the Gulf Coast and as a receiver of imported product distributed further. Of the almost 700 thousand B/D of clean product, 60% was gasoline.

The South Atlantic, as shown in the graph, is significantly less important for barge transport. Large volumes move into the region via tanker, with further distribution by truck, not coastwise vessels. As noted in the next section, some of these patterns may shift in the future.

Section IV. THE OUTLOOK FOR WATERBORNE COMMERCE

We have used U.S. Department of Energy/Energy Information Administration estimates to frame our outlook for future waterborne oil trade. We looked first at EIA's regional demand forecasts, then at its national supply/demand forecasts, and finally at its international balances. This section contains our observations on changing coastwise movements, regional import trends and the worldwide trade balance that allows us to forecast tanker demand.

A. *EIA's Demand Forecast*

In its base case, EIA shows U.S. oil demand growing by 1.7 million B/D between 1991 and 2000, from 16.7 to 18.4 million B/D; three-quarters of the growth is in the three main light products, gasoline, distillate and jet fuel. See Figure 10. The largest volume growth is in gasoline, with 500 thousand B/D incremental demand over the period. Distillate runs a close second volumetrically, but outperforms gasoline substantially in percentage terms: in line with other forecasts, the use of distillate in the transportation sector continues to climb, dampened by the declining use of distillate for heating. Residual fuel oil demand shows significant growth, almost 200 thousand B/D, or more than 16% over the period. The growth for residual fuel oil is a reversal, brought about by higher utilization in oil-fired power plants as a generation of nuclear and other electricity facilities are retired.

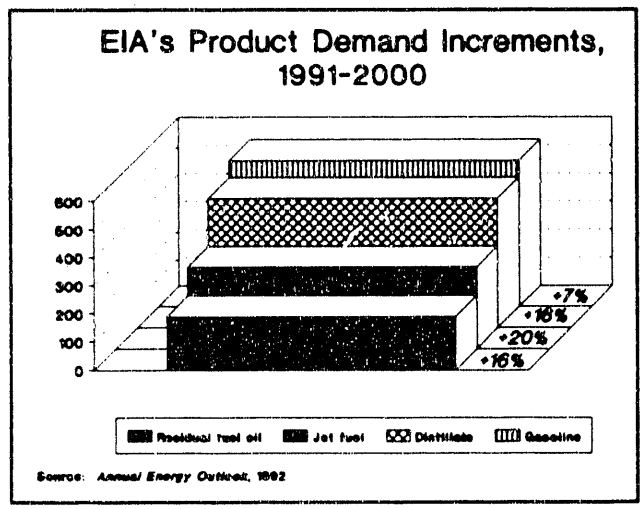


Figure 10

EIA's point of view is not the only one possible. In particular, its rapid growth in gasoline demand outstrips other estimates, and drives the need for incremental oil shipments. In the face of less robust growth, or even stagnant demand, the transportation growth -- feeding imported crude to refineries and transporting product to consuming markets -- is dampened. EIA's forecast also seems to have a high survival rate for refineries. If, as some others expect, the environmental product quality and facilities challenges cause refinery capacity to close, incremental oil transport will be imported, not coastwise.

On a regional basis, the pattern of EIA's forecast is very clear. As shown in Figure 11, the growth is primarily in the South and West, like a ring around the country's

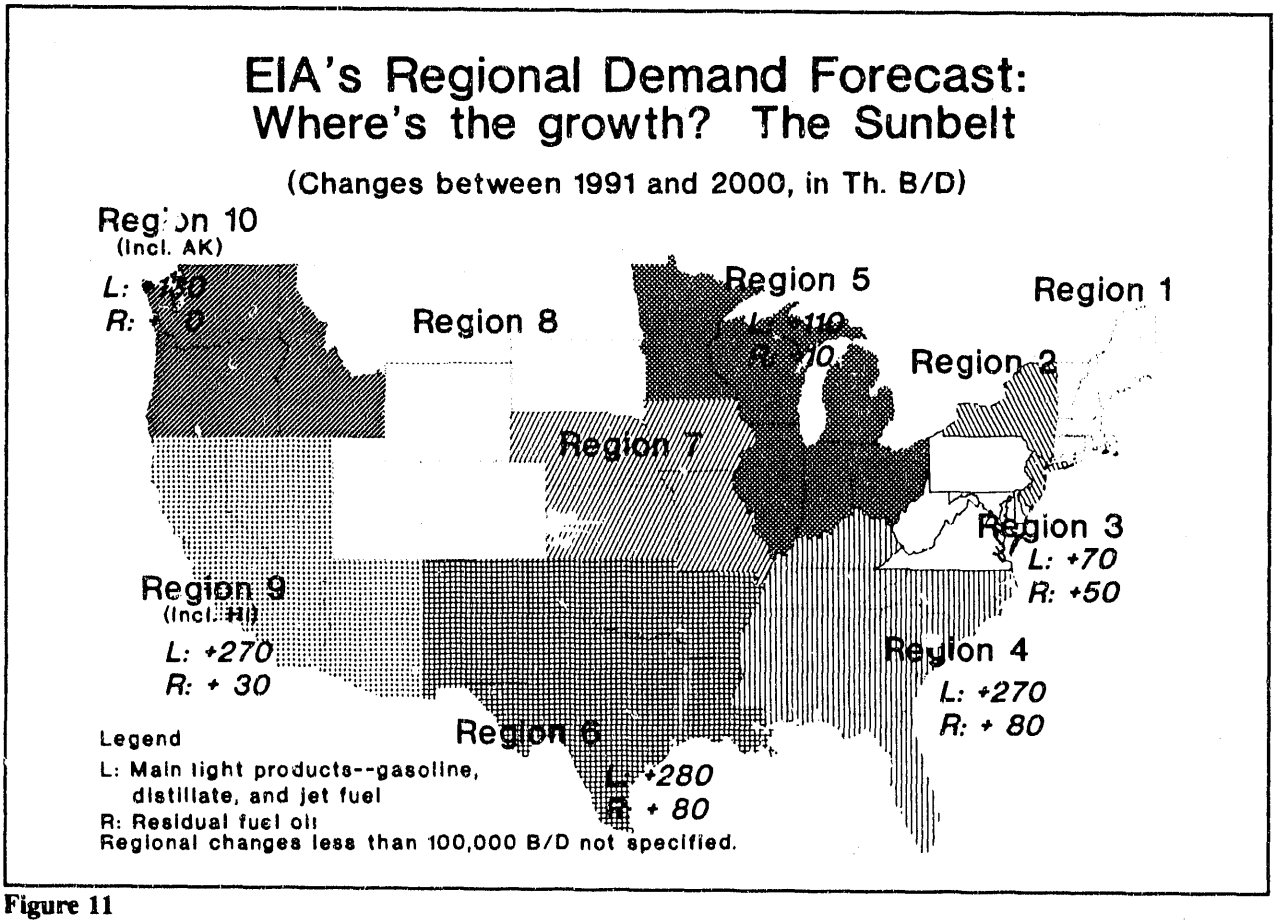


Figure 11

periphery. (Note that EIA's regions conform to Federal administrative districts, not PAD districts.) The lowest growth areas are the two Federal regions in the Northeast (Regions 1 and 2 on the map), the traditional oil consumers and importers. A move away from oil in the residential/commercial sector makes these two the only regions with a decline in distillate consumption over the period. While the rate of growth in the Rocky Mountain States is impressive, the region's volume remains unimportant in overall balances.

The robust growth regions are in the Sunbelt -- the South Atlantic/Gulf Coast (Region 4), the middle Southwest (6), and California/Arizona (9). EIA estimates that these regions will have rapidly rising light product demand, with growth approaching 300 thousand B/D in each. As shown in the following table, gasoline is the product with the greatest volume growth and distillate and jet fuel show the greatest rate of growth. The increase in jet fuel, almost 200 thousand B/D, has a relatively small effect on marine shipments, since most is produced domestically and transported via pipeline, not barge.

Light Product Demand in EIA's High Growth Regions

Region:	4	6	9	3-Region Total	Increment 1991-2000	
	----------Million B/D----------					%
Gasoline	1.55	1.03	1.11	3.69	.36	11%
Distillate	.58	.53	.36	1.47	.27	23%
Jet Fuel	.27	.38	.40	1.05	.19	22%
Total	2.40	1.94	1.87	6.21	.82	15%

Region 4: KY, TN, MS, AL, FL, GA, SC, NC
Region 6: NM, TX, OK, AR, LA
Region 9: CA, NV, AZ, HI

These regional patterns carry implications for coastwise shipping:

- Demand is stagnant in the Northeast, so the need for new tank barges will come from OPA retirements, not from demand for net additional capacity.
- Falling demand for distillate as a heating fuel will continue to flatten the winter peak transport needs; while on-highway diesel use exhibits less seasonal variation than gasoline use, rising diesel consumption will still tend to pile transport needs into the second and third quarters.
- The Sunbelt's growing product demand will require additional barge traffic in the Gulf Coast and Southeast. Pipeline capacity is full, and even planned expansions of the largest line, Colonial, to its southeastern markets will not fully accommodate EIA's forecast regional light product growth.
- The need for "black oil" (dirty) barges may also move South. However, incremental demand for residual fuel oil has traditionally been met from imports, a pattern likely to continue.

B. *EIA's Supply/Demand Balance*

EIA is forecasting increased oil imports and import dependency, just like other observers of the market. The trends at work were set in motion decades ago, briefly arrested in the early part of the 1980's, and resumed in the last five years. By 2000, imports in EIA's Base Case will reach 10.6 million B/D, with net imports of 9.8 million

B/D, for a net import dependency of 53%. EIA's outlook for domestic production includes sharp drops in Alaskan production (to 930 thousand B/D in 2000, almost cutting it in half from the 1991 level) and in Lower-48 production (the 600 thousand B/D decline, to just under 5 million B/D in 2000, seems moderate in comparison).

The decline in U.S. production and the increase in demand falls directly on the balancing item: crude oil imports rise by 1.9 million B/D, or 33%, over the 1991-2000 period, and product imports, in EIA's balance, rise by 900 thousand B/D, a staggering 45% increase. (It is interesting to note that the product import surge is caused by the demand increase, not by a reduction in the volume coming from domestic refineries, as would have been the case if the new environmental economics were closing significant capacity. As mentioned above, not all observers would share this view.)

EIA's exports decline in the decade of the nineties, but the balance retains some crude oil exports, at least some of which would be going from Alaska to the Virgin Islands. (An argument can easily be made, however, that these volumes would be pulled back to satisfy crude-short West Coast demand.) Product exports, driven by refining economics and world markets, remain at 700 thousand B/D, a modest 10% decline from the 1991 level.

EIA's forecast does not include a regional supply/demand balance, but we have made some broad assumptions to allow us to generalize about where the incremental imports will be going. The result is shown in Figure 12.

1. Crude Oil

The Gulf Coast, which feeds PAD II as well, must import to replace the decline in Lower-48 production, the cessation of Alaskan crude shipments to the Gulf Coast (both tanker and pipeline), and the loss of pipeline shipments from Canada, and to supply increased demand. The region therefore takes the lion's share of the increase in crude oil imports -- more than half of the increase in total imports, and all of the shift from pipeline to waterborne. These increments will mean that almost three-quarters of total crude oil imports in 2000 will be coming through PAD III. PAD V imports have to replace Alaskan supplies, and to do so must quintuple; more than 10% of U.S. crude oil imports will be coming into the West Coast by 2000. The shift in sourcing is not reflected in total tanker traffic: what used to come from Alaska in Jones Act ships will now come from abroad, probably in foreign ships. The East Coast gets a relatively small share of the incremental crude oil imports -- its refinery capacity is unlikely to expand, and it has traditionally been a net "importer" of product both from the Gulf Coast and abroad. By 2000 its share of crude oil imports will have fallen to about 15%. The shifts in regional trade volumes will obviously impact the maritime industry's focus on different State laws.

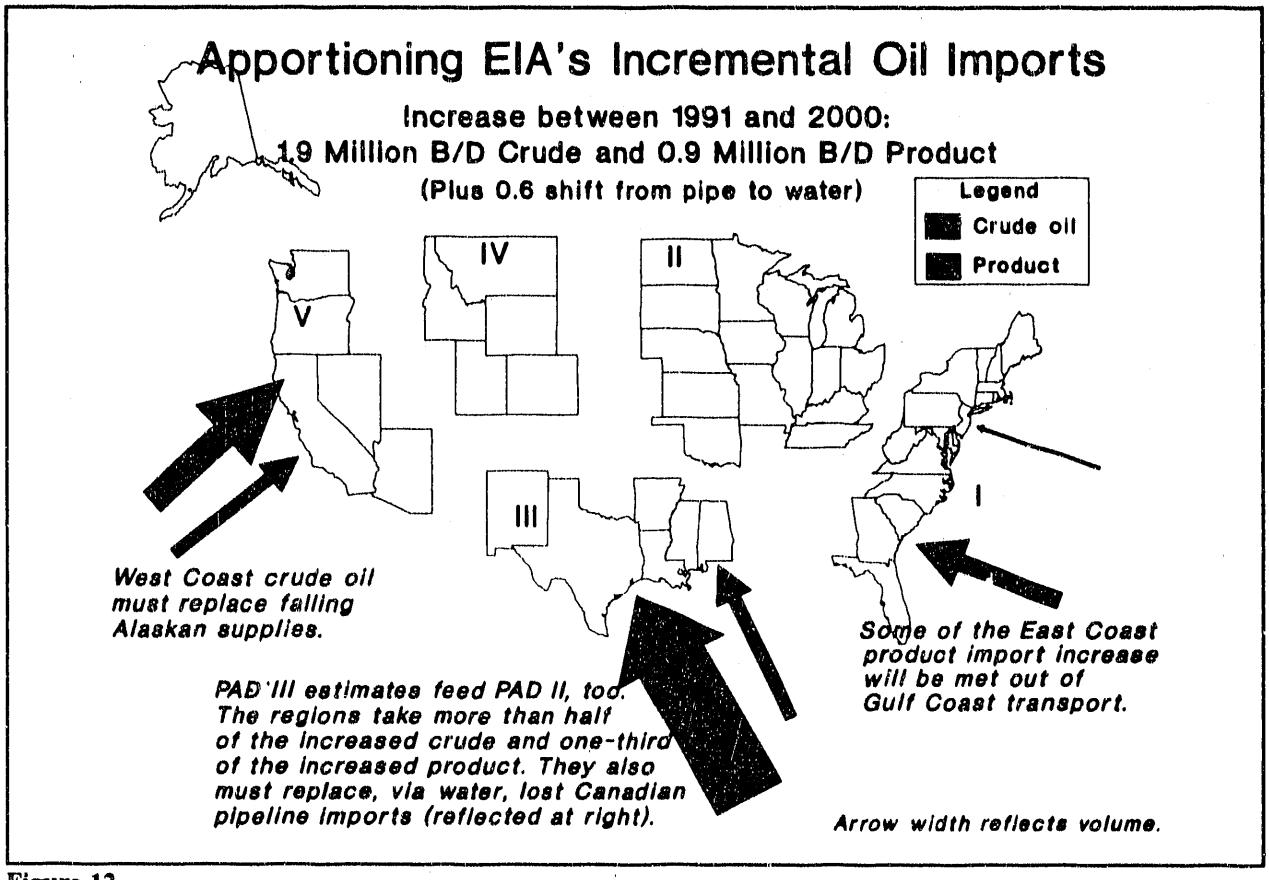


Figure 12

2. Products

Increased product imports are split about evenly among the three coastal regions. Because of EIA's very rapid demand growth in the Sunbelt, the East Coast's increase will be in the South Atlantic region. As noted, EIA's regional forecast is not based on PAD districts. Region 4, one of those with very rapid growth, straddles PAD I, PAD II and PAD III. The States included in the Region but not in PAD I -- Kentucky, Tennessee, Alabama and Mississippi -- accounted for almost 40% of the region's demand in 1989, the latest State-by-State data available. While on our map we have shown imports into Region 4 as East Coast volumes, it is likely that some fairly significant share of the increment will come into the Gulf Coast, not the East Coast. The East Coast will remain the largest product import region, but Gulf Coast product imports could nearly double by 2000.

C. *Trade Flow Estimates Based on EIA's International Outlook*

Using EIA assumptions of global supply/demand balances, PIRINC estimates that world seaborne trade will grow by approximately 4 MMB/D between 1990 and 2000.

Two-thirds of the increase will come in the latter half of the decade, which means that the average annual growth in seaborne petroleum trades will rise from less than 1% between 1990 and 1995 to 1.7% thereafter.

The Middle East will be the dominant source of marginal crude; in the U.S., for example, the Middle East will supply two-thirds of incremental crude demand until 1995, around 90% during the following five years:

- U.S. imports from the Middle East will rise by almost 2.2 MMB/D, with 1.4 MMB/D of this growth coming after 1995.
- Middle East exports to South East Asia -- including Japan -- will rise by 2.1 MMB/D, with 1.4 MMB/D of this growth coming before 1995.
- There will be a rapid decline in net import dependency in Europe through the mid-1990's, as North Sea production rises, but this will be tempered in the latter half of the decade as North Sea production stabilizes (or declines) and East European demand grows. Throughout the period, Middle Eastern crude will tend to fill the gap left by the shortfall in crude from the CIS. Middle East exports to Europe will rise by 0.9 MMB/D, with growth spread more evenly throughout the period.
- Latin American exports will continue to grow, though there is a good deal of uncertainty over the volume and mix of Venezuelan exports, given the doubts over the future level of investment in refineries there.
- Africa's role as an exporter will probably show some small decline.
- As the 1990's progress, crude flows will account for a larger proportion of incremental movements, as refining gravitates to demand regions. Proportionately, product movements are likely to peak in the mid-1990's.

U.S. oil imports currently account for approximately one-quarter of the world's seaborne oil trade, 30% of world tanker demand (because of the longer than average voyages involved). The importance of the U.S. to the tanker market will grow significantly: the key element for future tanker demand is the U.S. imports from the Middle East. All three major growth trades above are long-haul, but the European imports are less regularly so; Middle East shipments to Europe may be intra-Mediterranean movements, or Red Sea or Arabian Gulf to Mediterranean shipments, as well as those on the

long-haul Cape route. The bulk of the growth in the South East Asia trades occurs before 1995, when the tonnage surplus in the tanker market is still expected to be in evidence. After 1995, the tanker market gets more interesting, as the effects of both demand growth and OPA begin to exert a serious influence on the tanker supply/ demand balance for the first time.

3. OVERVIEW OF U.S. OIL POLLUTION LAWS

Section I. HISTORICAL PERSPECTIVE

Federal legislation addressing oil pollution is not a recent development. Rather, it has evolved over the past 70 years, starting with the passage of the Oil Pollution Act of 1924, which imposed liability upon persons whose gross negligence resulted in a discharge of oil. The concept of strict liability for oil pollution damages was introduced in the Water Quality Improvement Act of 1970, as amended by the Federal Water Pollution Control Act of 1972 ("FWPCA"). But significantly the FWPCA limited liability to $150 per gross ton of the vessel unless the spill was caused by willfulness on the part of the owner or operator.

In the late 1970's two major oil spills, one in the U.S. (*Argo Merchant*) and one abroad (*Amoco Cadiz*), refocused the attention of some on oil pollution liability laws, resulting in a slow but sustained effort over a period of ten years to refashion Federal law so as to provide greater liability for oil pollution damages. Indeed, the effort might have been for naught had it not been for the now infamous *Exxon Valdez* spill and the several smaller, but nonetheless sensationalized, spills that occurred in the succeeding months and placed an exclamation mark on the need for reform. And so, Congress determined, in short order, to enact sweeping changes in the Oil Pollution Act of 1990. Some have feared that the resulting legislation does not fully effect the intent of Congress and may serve to impede the import of commodities to the United States.

In many respects OPA is similar to the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), which applies to discharges of hazardous substances onto land or water. (42 U.S.C. 9601 et seq.). Each of these statutes imposes strict liability for discharges of pollutants, utilizes a fund for reimbursement of costs, establishes financial responsibility requirements and provides similar methods for imposing unlimited liability. In fact, when OPA was being drafted Congress considered decisions rendered by courts in interpreting definitions contained in CERCLA. For example, initial proposed language for OPA included an exclusion for passive holders of security interests in the definition of "owner or operator." Because several courts had

interpreted identical language contained in CERCLA in such a way as to impose liability on banks that had the power to effect certain decisions of their borrowers, this exclusion was not included in OPA as passed. (§ 1001(26)).

OPA amended the liability limitation provisions of the FWPCA by increasing the limit to $1,200 per gross ton for tankers ($600 per gross ton for non-tankers) and by providing that a violation of a safety regulation would abrogate the limitation of liability. As more fully discussed below, the effect of the latter provision is to make it likely that in most oil spill cases an owner or operator will face unlimited liability.

OPA's most difficult provision: it doesn't pre-empt State laws, which may be overlapping, conflicting and unrealistic. Uniformity no longer exists.

Perhaps the most significant change brought about by OPA is that it has created a lack of uniformity of law. Prior to OPA, the Federal oil pollution liability scheme assured, albeit indirectly rather than directly, uniformity of laws without necessarily pre-empting the rights of the States to enact their own pollution liability laws. The FWPCA and its predecessor laws were silent on the interplay of State law, leaving the States free to enact their own pollution liability laws, which many did. But the Limitation of Liability Act of 1851, providing protection to shipping interests against tort liability of any nature, effectively placed a limit on the liability that could be imposed by State law. The 1851 Act entitles vessel owners to limit liability to the value of the vessel after the occurrence and pending freight, provided the owner did not have privity or knowledge of the cause of the damage. Although the 1851 Act has been criticized as anachronistic and unnecessary in more modern times, because the protection it affords could just as well be provided by insurance, at the time of the passage of the FWPCA and its predecessors, it was a thriving law.

Congress no doubt recognized that the 1851 Act would have the practical effect of assuring uniformity, enabling Congress to sidestep the issue of legislated uniformity in the FWPCA or its predecessors. However, OPA has not only expressly preserved the rights of the States to enact and enforce their own pollution liability law, but has abrogated the applicability of the 1851 Act to State law claims. Uniformity no longer exists.

Section II. KEY PROVISIONS OF OPA

A. *Liability*

OPA applies to discharges of oil of any kind or in any form within the Exclusive Economic Zone ("EEZ") of the United States (up to 200 miles offshore). (§1001(22)).

In the case of a discharge from a tank vessel, it imposes strict, joint and several liability upon the owner, operator or charterer by demise of the vessel, but limits liability to the greater of $1,200 per gross ton of the vessel, or $10 million for vessels over 3,000 gross tons or $2 million for vessels of 3,000 gross tons or less. The liability of non-tank vessels is limited to the greater of $600 per gross ton or $500,000. (§1004). These limitations will not apply, however, in the event the discharge was proximately caused by "the violation of an applicable Federal safety, construction, or operating regulation" by the responsible party or his agents or employees. The Federal regulations on safety and operation are very specific, and in almost every instance where a discharge occurs it is caused by an act which would be considered a violation of such a regulation. Therefore, in effect this exception nullifies the limitation provision because a spill will almost always result from the violation of such a standard or regulation.

B. *Defenses*

Unlimited liability isn't a new concept. What's new is the seeming ease with which it may be imposed.

Liability will not be imposed upon a responsible party if it proves that the discharge was caused solely by an act of God, act of war or act or omission of an unrelated third party. With respect to the last defense, the third party cannot be contractually related to the responsible party, and may not be its employee or agent, and the responsible party must prove that it exercised due care with respect to the oil and took precautions against foreseeable acts of third parties. (§1003). The defenses will not be available to a responsible party that failed to make a required reporting of the incident, failed to provide assistance or cooperation when such was requested by a Federal official, or failed to comply with a Federal order with respect to the discharge. In any event the responsible party will not be liable to a particular claimant whose gross negligence or willful misconduct caused the incident. These severe limitations on traditional defenses have significantly changed risk assessment under OPA.

C. *Removal Costs and Damages*

Responsible parties are liable for removal costs incurred by the United States, a State, or an Indian Tribe acting under Federal or State law, and those incurred by any person who has acted in compliance with the National Contingency Plan. Liability is imposed for damages as well, including injury to natural resources or real or personal property; loss of subsistence use, revenues or profits; and the costs of providing public services. (§1002). Trustees for the United States, a State, or Indian tribe may recover for natural resource damages and any person who loses subsistence use of natural resources may recover damages for the loss. Owners and lessees of real or personal property may recover damages for its injury or destruction, and any person (e.g. fisher-

man) may be compensated for lost profits resulting from destruction or damage to real or personal property or natural resources. In addition the Federal government and State and local governments may recover damages for loss of tax revenues, etc. resulting from injury to property or natural resources. (See Chapter 4).

D. *Financial Responsibility*

In support of the increased limits on liability, OPA requires all self-propelled vessels over 300 gross tons, and such non-self-propelled vessels which carry oil as cargo or fuel, to maintain evidence of financial responsibility equal to its maximum limited liability under OPA in order to gain entry into U.S. waters. Pursuant to presently proposed United States Coast Guard regulations to give effect to this requirement, several alternatives are provided to allow an owner to demonstrate financial responsibility. For most owners, insurance is the only potentially viable basis to demonstrate such financial responsibility. But the proposal is that the insurer must give an unconditional guarantee without regard to any policy defenses, and is subject to direct action for any liability claims up to the amount of the guarantee. Indeed, this has always been the case. Under the FWPCA, however, the industry's insurers, the so-called Protection and Indemnity Clubs ("P&I Clubs"), were willing to provide such guarantees as an accommodation to the U.S. until it agreed to adopt the international liability regime. But the increased risks under OPA are not acceptable to the P&I Clubs and therefore the Clubs are unwilling to provide unconditional guarantees for the amounts required under OPA. (See Chapter 4).

E. *Spill Prevention*

OPA establishes a requirement that all vessels contracted for after June 30, 1990 or delivered after January 1, 1994 be equipped with double hulls and provides a phase out of all vessels that are not equipped with double hulls based upon age and gross tonnage. The schedule creates an accelerating phase-out of vessels by retiring them at increasingly younger ages. (Appendix I). The Coast Guard is required to assess alternative designs to double hulls if they are shown to be equally effective in preventing pollution, and to make appropriate recommendations to the Secretary of Transportation. (See Chapter 4). OPA also establishes operational requirements intended to prevent situations which may lead to a discharge: officers and seamen aboard a tanker may not work more than 15 hours in any 24 hour period nor more than 36 hours in any 72 hour period; the master (or individual in charge of the vessel) may be temporarily removed if the next two most senior officers believe the master is under the influence of drugs or alcohol; the Coast Guard will establish escort requirements for single skin tankers; the Coast Guard will review alcohol and drug abuse records before issuing licenses and merchant mariner documents; requirements for removal equipment to be carried on vessels will be established; and vessel traffic systems ("VTS") will be constructed at

certain ports (New York and San Francisco have VTS). (§§4101, 4104, 4107, 4114, 4116).

Vessel owners and operators are required to submit vessel-specific plans for responding, to the maximum extent practicable given available technology, to a worst-case discharge from their vessels operating in U.S. waters. (§ 4202). The plans must be consistent with the National Contingency Plan and identify the means, by contract or otherwise, through which the vessel can ensure the availability of equipment and personnel necessary for removal and/or mitigation of a worst-case discharge. The plans also must include specific notification procedures, designation of the person on board with authority to implement clean-up and a description of crew training, equipment testing and unannounced drills. (See Chapter 4).

F. *Other Law*

OPA expressly provides that the various States of the United States are free to enact and enforce their own oil pollution prevention and liability laws and tc impose additional requirements upon responsible parties. As previously noted, it specifically abrogates the 1851 Act with respect to State law pollution liability claims. Apart from ensuring that claimants will not be able to claim more than once for any particular damages, OPA does not specify how claims valid under an array of different Federal and State laws will be resolved.

Section III. KEY PROVISIONS OF STATE POLLUTION LIABILITY LAWS

Each coastal State has enacted some form of pollution legislation addressing discharges of oil from vessels. Most existed prior to the enactment of OPA, but have taken on added meaning in light of the abrogation of the 1851 Act. Several States have enacted or amended laws since the passage of OPA. These laws have generally had the effect of expanding liability and involving the State authorities in pollution prevention and response matters, including vessel procedures and requirements. A synopsis of each coastal and Great Lakes State's laws is included as Appendix II.

The standards for imposing liability, the scope of responsible parties, and the limits of liability (or lack thereof) vary widely among the States. Some States impose liability upon persons whose negligence caused a discharge of oil, while others impose strict unlimited, joint and several liability upon vessel owners and operators, cargo owners, and time or voyage charterers. Appendix II includes a memorandum containing a list of States categorized by the standard for imposing liability and the scope of responsible parties. Figure 13 illustrates the different standards employed by the coastal

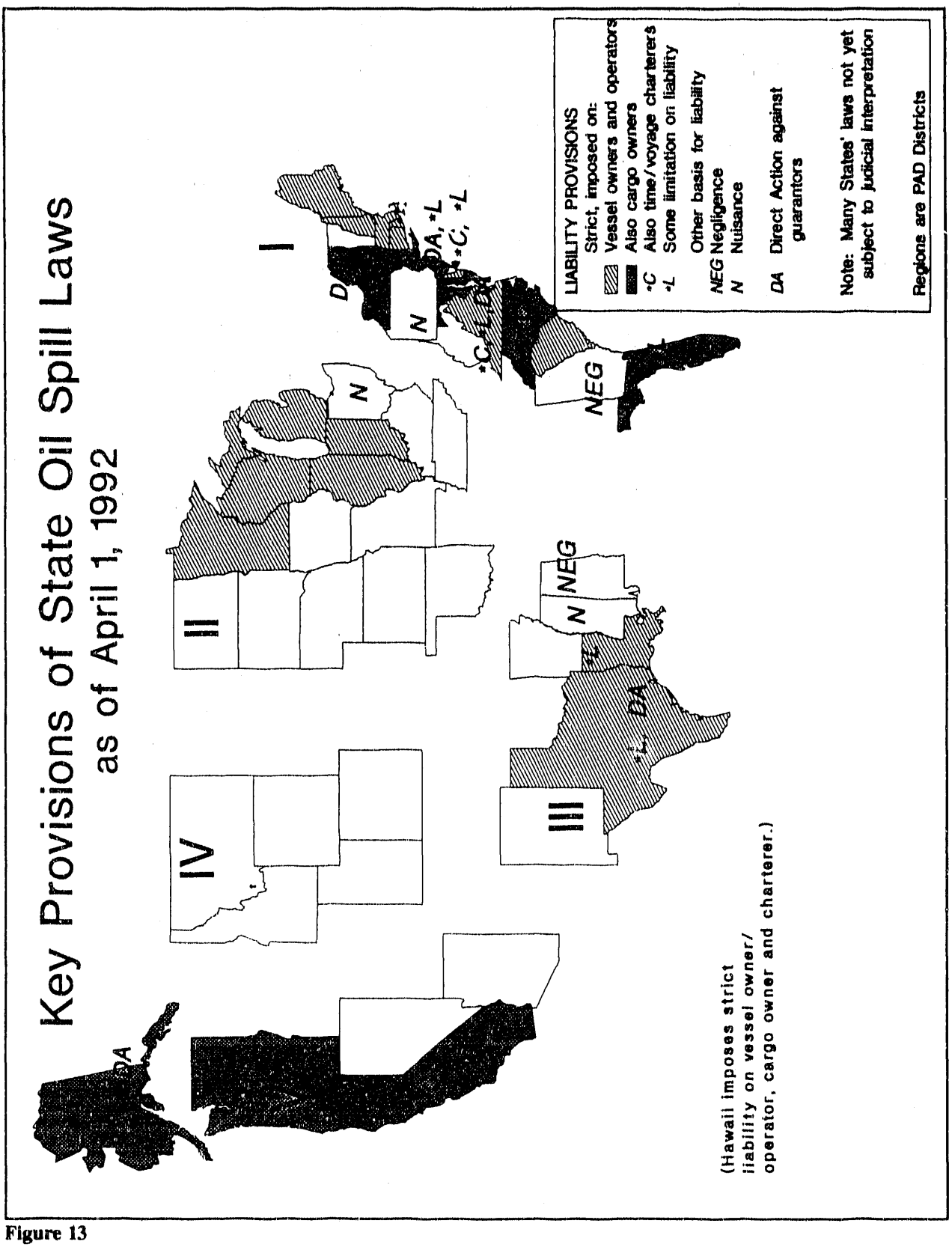

Key Provisions of State Oil Spill Laws
as of April 1, 1992
LIABILITY PROVISIONS
Strict, imposed on:
Vessel owners and operators
Also cargo owners
*C Also time/voyage charterers
*L Some limitation on liability
Other basis for liability
NEG Negligence
N Nuisance
DA Direct Action against guarantors
Note: Many States' laws not yet subject to judicial interpretation
Regions are PAD Districts
I
II
III
IV
N
NEG
DA, *L
*C, *L
(Hawaii imposes strict liability on vessel owner/ operator, cargo owner and charterer.)

Figure 13

and Great Lakes States and also shows that the laws of five States, Alaska, New Jersey, New York, Texas and Virginia, contain direct action provisions. Although Federal certificates of financial responsibility would expressly limit a guarantor's liability, that limitation might not apply under State law.

The non-preemption of States' rights to adopt and enforce statutes and regulations concerning oil pollution is not limited to the imposition of liability but extends to operational and financial responsibility requirements as well. At least fourteen States have some form of financial responsibility requirement in their statutes. Not all of these requirements are enforced by State administrative agencies, because of lack of personnel and other reasons. Financial responsibility amounts required by the States range from Washington's requirement of the greater of $150 per gross ton or $1 million, to California's flat requirement of $500 million, which will increase to $1 billion by the year 2000, to Alaska's requirement of the greater of $300 per barrel of the vessel's storage capacity or $1 billion. Several State administrative agencies will accept Federal Certificates of Financial Responsibility, or evidence of enrollment in a P&I Club, in satisfaction of their requirement. However, States are free to require amounts in addition to Federal certificates. (See Figure 14 and Appendix II).

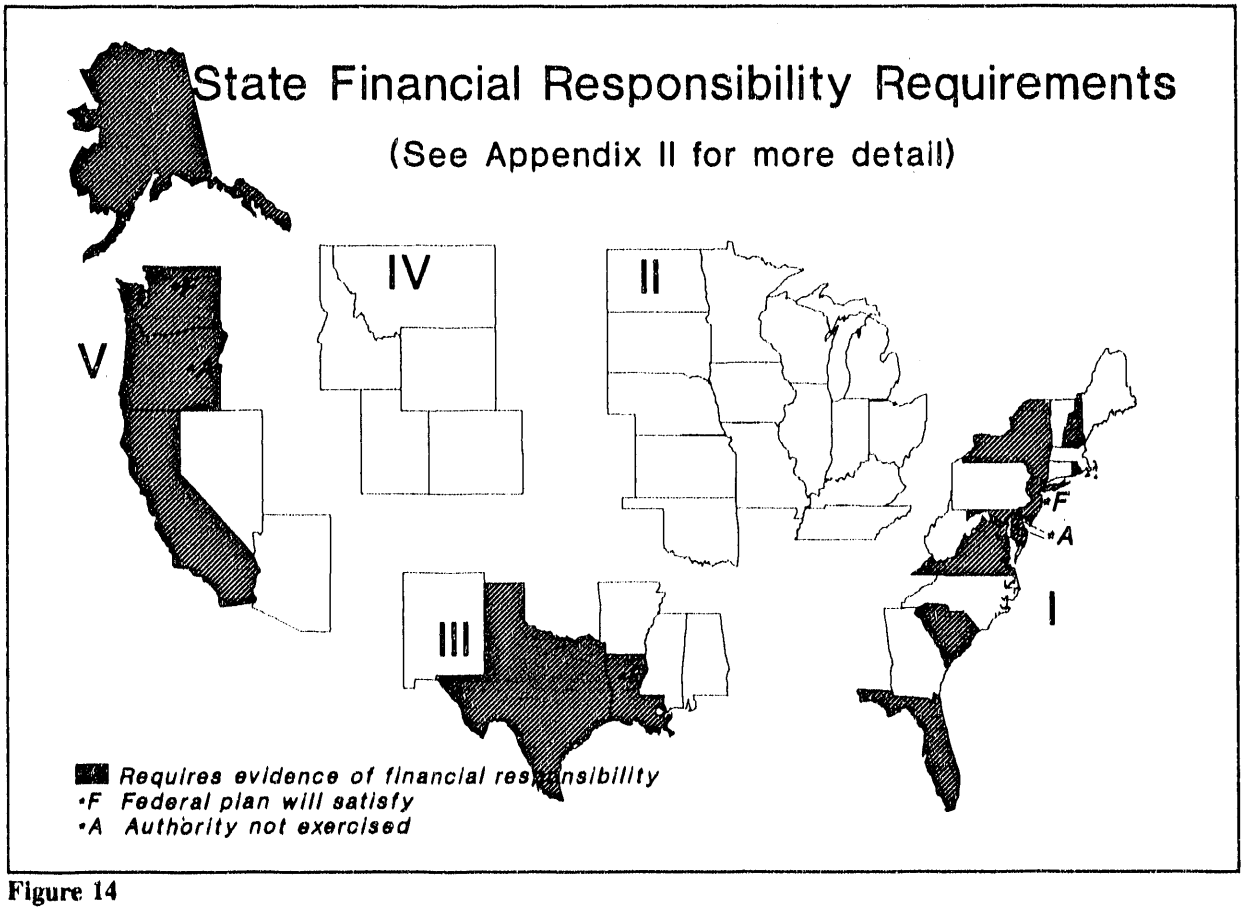


Figure 14

A. *Trends Among States*

As was the case with Congress, the legislatures in a number of States rushed to enact broader and more stringent oil pollution liability laws. The result is very much a hodgepodge of State laws, but some trends, or at least tendencies, are evident.

All of the States revising liability provisions have adopted a strict liability scheme with limitations, akin to OPA. Hence, it would seem that States disposed to revamp what are considered to be inadequate statutes are likely to embrace an OPA-like scheme. This is not to say that those States that already have broader statutes in place are likely to amend them to bring them in line with OPA.

The traditional responsible party for a spill is the vessel owner or operator. OPA, in its proposed form, sought to expand this to oil cargo owners but it was not included in the final legislation. A number of States had laws in effect prior to OPA imposing liability on cargo owners and such liability was not curtailed by the limits of the 1851 Act. No State has enacted a law to include cargo owners as a responsible party since the passage of OPA, although this has been considered by several States. Thus, despite some public outcry at the time of *Exxon Valdez* that the oil cargo owners would have to be made responsible, it would appear that Congress and the State legislatures are not disposed to be so expansive.

Soon after passage of OPA there was a movement among several States, most notably Rhode Island, Florida and California, to impose financial responsibility requirements that vessel owners or operators meet the minimum financial standards of the particular State. These requirements were initially said to be in addition to the Federal requirements, but adopted the same guarantee provisions. It soon became apparent to the States that the owners would not be able to comply and so by amendment of the requirements, by less stringent enforcement, or by foregoing the requirements altogether in deference to the Federal requirements, the States have resolved the immediate dilemma created by their initial stance.

B. *Discussion of Uniformity of Laws*

To illustrate the diversity of the laws of the various States one need not compare all of the States in the union; regional summaries suffice.

1. Gulf Coast

A massive oil spill in the Gulf of Mexico could impact the waters of five states: Florida, Alabama, Mississippi, Louisiana and Texas.

Florida is a State with one of the most active environmental agencies in the union. Its oil pollution law imposes strict liability upon vessel owners and operators that is limited for clean up and removal costs other than those for damages to natural resources. (A separate law addressing natural resource damages, including a formula for assessments, was recently passed). Cargo owners are subject to contingent liability if the vessel fails to satisfy certain State enforced financial responsibility requirements. Fines of up to $50,000 per day of violation may be imposed pursuant to the statute.

By contrast, Alabama's Water Pollution Control Act provides for liability to be imposed upon persons whose negligence results in a discharge of pollutants. There is no strict liability or contingent liability for the acts of another. If the act causing the spill was willful or grossly negligent a penalty of up to $25,000 per day may be imposed.

Mississippi's Air and Water Pollution Control Law imposes liability based upon a theory of public nuisance on any person who causes pollution of the State's waters. There is no contingent liability upon cargo owners and no limit on liability. Separate civil and criminal penalties may be imposed of up to $25,000 per day each.

The laws of Louisiana would impose strict limited liability upon any person who discharges pollutants into the waters of the State. The civil and criminal penalties that may be imposed under the Louisiana law could amount to $2 million, plus $100,000 per day of the violation, for a severe spill or knowing discharge.

Texas recently passed the Oil Spill Prevention and Response Act of 1991, which imposes strict limited liability upon vessel owners, operators or charterers by demise, and upon any other person who caused, allowed or permitted the discharge. Overall liability for a large vessel is limited to the greater of $1,200 per gross ton or $100 million, but liability for damages to natural resources is not subject to limitation. Penalties range from a penalty of $1,000 per barrel of oil discharged to three times the response costs incurred by the State if the responsible party fails to contain and participate in removal of the discharge.

Which law may apply to a spill could be dependent upon tidal, current, weather and wind conditions prevailing at the time of the discharge. This situation makes accurate risk assessment impossible. Prevailing conditions could result in injury to the shores of any one or more of the States, which have radically different regulatory agencies and regimes.

2. West Coast

Unlike the Gulf Coast States, the States along the West Coast have similar laws, and in fact have considered entering a compact with respect to oil pollution regulation. Even with the similarities among the statutes of the West Coast States, major differences have arisen since the passage of OPA.

California's legislature adopted one of the most progressive oil pollution statutes in the country with the passage of the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990. The Act imposes strict unlimited liability upon cargo owners, vessel owners, vessel operators, demise charterers and "lessees." The State issues separate certificates of financial responsibility for vessels, which are required to provide evidence of financial responsibility in the amount of $500 million. Evidence of enrollment in a P&I Club without a guarantee requirement is acceptable to the California Department of Fish and Game for a certificate of financial responsibility. However, the amount of evidence required may exceed available P&I cover by the year 2000 (when California's financial responsibility requirement will be in the amount of $1 billion). The Act would also impose civil and criminal penalties of up to $500,000 per day, plus between $10 and $30 per gallon of oil discharged.

Washington and Oregon each impose strict unlimited liability upon cargo owners and vessel owners and operators, but neither State's statute contains language which could be interpreted to impose liability upon time or voyage charterers. Each also has financial responsibility requirements, but neither approaches the amounts set out in California's Act. Nor does either impose the quantum of damages imposed under California's law.

3. East Coast

Lack of uniformity is not limited to the Gulf and West Coasts: the East Coast States have laws inconsistent with each other as well. While Pennsylvania's oil pollution laws impose liability on persons who cause a discharge of oil, and base the cause of action upon nuisance, North Carolina's impose strict, unlimited liability upon vessel owners and operators, cargo owners and time or voyage charterers. The statutes of Virginia and Delaware could be interpreted to impose strict liability upon time or voyage charterers, but not upon cargo owners. The statutes of Maryland, New Jersey and New York could be interpreted to impose liability upon cargo owners, but not upon time or voyage charterers. Some East Coast States such as Delaware, Florida, New Jersey and Virginia limit liability; the rest do not.

Overall, the rights of the States to legislate freely in the area of oil pollution prevention and liability has placed vessel owners and operators not only in the unnecessarily onerous position of having to assure compliance with Federal and State regulations that overlap, but of having to comply with different procedures and face different liabilities in each jurisdiction.

4. INTERPRETING THE LEGISLATION

Of the four aspects of OPA critical to the world tanker market, only one, ship design, is relatively clear cut; design requirements have been specified and a timetable for implementation is in place.[2] The other three issues: Certificates of Financial Responsibility ("COFR's"), damage assessment, and operational requirements (including spill response measures), still await final rulings.

This Chapter describes the issues, their current status, and the attitudes of the various parties involved and/or affected. It should be stressed that each of the issues except ship design is covered not only by OPA, but also by individual State legislation, which can vary widely as just discussed in Chapter 3. Reference to individual State attitudes is kept to a minimum in this section, but two points must be remembered:

- A few States have especially harsh laws concerning COFR's, unlimited liability in general, and spill response requirements (contingency plans), which could result in shipowners boycotting such States, but....

- The most difficult aspect for shipowners and operators is coping with a plethora of laws covering each issue: the time and effort required to ensure compliance with each State's requirements is enormous. Differences are often small, but failure to comply with the letter of the law in each State to which a vessel trades is unthinkable: the price -- permanent exposure to unlimited liability -- is just too high.

[2] Matters have been complicated by the recent IMO rulings on mandatory retirement ages (Section I.B. of this Chapter). For some tankers these result in a faster retirement rate than under OPA, which raises the interesting possibility that the Coast Guard might have to withdraw from being a party to MARPOL if the ships fail to comply.

Recent reactions by some owners and operators of tankers suggest that the latter consideration is more likely to restrict ship trading patterns than the former.

Section I. SHIP DESIGN

A. *U.S. Requirements*

OPA requires that all oil tankers operating in the Exclusive Economic Zone of the U.S. after 1/1/2010 be equipped with double hulls, except for those that have either double sides or double bottoms, which are given a further five-year grace period. This does not apply to tankers transiting U.S. waters or the EEZ in innocent passage. Tankers discharging via LOOP, or lightering in designated zones more than 60 miles offshore, do not need double hulls until 2015. (Appendix I).

The Secretary of Transportation (Coast Guard) is required to evaluate other structural and operational improvements that can be imposed during the phase-in period for double hulls, in order to improve the environmental soundness of existing operations as much as is "*economically and technologically feasible*" (Conference Report). Should such improvements prove feasible, the Secretary is empowered to mandate their introduction. Deliberations on this issue are currently in full swing.

The Secretary is also required to determine "*whether other structural and operational tank vessel requirements will provide protection to the marine environment equal to or greater than that provided by double hulls*," and to report any recommendations for legislative action to Congress.

By far the most comprehensive comparison of alternative tanker designs currently available is the National Academy of Sciences ("NAS"), "*Tanker Spills and Prevention by Design*," prompted by the grounding of the *Exxon Valdez* in March 1989 and published in February 1991. OPA specifically directs the Secretary of Transportation to consider the NAS's conclusions and those of other relevant studies prior to making future recommendations to Congress.[3] The Department of Energy specifically requested that PIRINC discuss the study's findings, and review international views on ship design.

1. Conclusions of the NAS Study

Though the year-long study was hurried, suffered from a lack of data in certain areas, particularly on loss of oil from different types of spill, and should not be regarded

[3] A brief discussion of basic ship design issues and a summary of the NAS study's assessment of the cost-effectiveness of various design alternatives is given in Appendix III.

as definitive -- as the authors readily profess -- there is no reason to argue with its overall conclusions:

- No single design is superior for all accident scenarios.

- Structural design standards, which have been refined and made more "efficient" since the first generation of VLCC's was built, are no longer adequate and should be revised to insure proper:

  i. corrosion protection
  ii. dimensions of structural members
  iii. use of high tensile steel

  Additionally, future designs should specifically cater to the possibility of involvement in accidents, hitherto a neglected practice in naval architecture. (This is particularly pertinent to placing of pipes and pumps).

- On the basis of cost-effectiveness, the double hull is among [our emphasis] the best values of the designs evaluated. They are particularly effective in low-energy (typically low-speed) groundings and collisions. The NAS could not differentiate between double hulls and mid-deck tankers. (Appendix III).

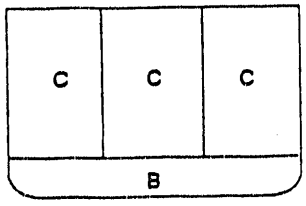
- Current criteria to ensure adequate stability following hull damage to single-hulled vessels are inadequate for double-hulled and related designs that have increased ballast compartments.

- In theory, one of the designs considered could perform better than double hulls in certain circumstances: the intermediate oil-tight deck with double sides ("IOTD w/DS" or mid-deck).[4] It is possible that in a high-impact collision or grounding of sufficient force to rupture both inner and outer hulls of a double-hulled ship, an IOTD w/DS tanker would spill less oil.

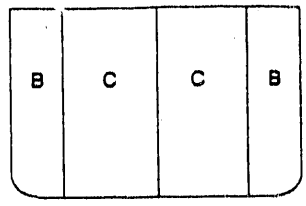
[4] The IOTD w/DS is not the only mid-deck design but in all current discussions in the media, it is the design to which "mid-deck" refers.

Hull Configurations

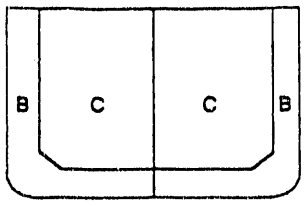
C = Cargo
B = Ballast



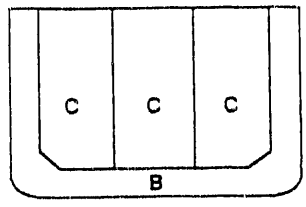
Double Bottom



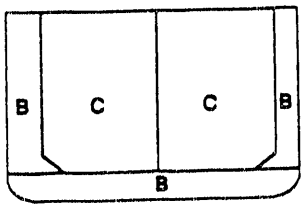
Double Sides



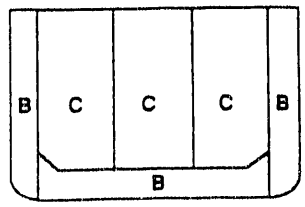
Double Hull ("L")



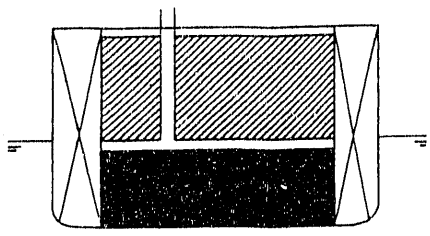
Double Hull ("U")



Double Bottom/Double Side



Double Side/Double Bottom



Intermediate Oil-Tight Deck with Double Sides
(Mid-Deck)

Source: NAS, *Tanker Spills: Prevention by Design*

Figure 15

- Full implementation in U.S. waters of any of the 17 design options considered would add 1 to 2¢ per gallon to the cost of transported oil.[5]

- Regardless of the designs chosen, all new tank vessels should have:

  i. IMO - recommended towing fittings on both bow and stern.
  ii. A reliable on-board system for transferring cargo from a damaged tank to another tank or another vessel.
  iii. No cargo piping in the ballast tanks.

- Serious consideration should be given to requiring that all existing tankers promptly meet the latest IMO provisions for pollution prevention for new tankers -- particularly the requirements for segregated ballast tanks ("SBTs"), crude oil washing systems ("COW"), and, possibly, protective location of ballast tanks. (See new IMO requirements announced March 1992, below).

At present the only seriously considered alternative to double-hulled tankers is the double-sided tanker with an intermediate oil tight deck, or mid-deck tanker, the only design over which the NAS Committee was split. Some Committee members felt that the U.S. Coast Guard should extend the Committee's evaluation of this design, to determine whether it was equivalent or superior to the double-hulled standard of OPA '90. The results could then be presented to Congress for immediate action. Other members felt that further appraisal by the IMO was needed before Coast Guard involvement or OPA-related action was appropriate, and this is the route being followed.

2. Summary of Key Design Issues

Stability

All the designs considered by the NAS Committee meet current stability requirements. Conventional SBT tankers are extremely stable, usually far exceeding IMO damage stability requirements. Much of the stability derives from the fact that when a loaded tanker's side tanks are breached, the chances are that loss of oil from the cargo tanks is compensated for by the empty ballast tanks taking in water. A double-hulled ship will just take on water (if only the outer hull is breached) with a greater loss of stability. While still meeting IMO requirements, the damage stability of some of the

[5] These calculations were done for NAS two years ago.

early double hull designs left quite a lot to be desired. Experience has shown that major improvements are possible and that the margin of safety can be increased to approximate those of a single-hulled MARPOL tanker.

Frequently cited limitations of a double-hulled ship are: that it is more inclined to stick fast after a grounding, that salvage can be more difficult, and that the ship will be more susceptible to destabilizing wave and tidal action. The NAS Committee was of the opinion that the great majority of tanker groundings at service speeds will leave the tanker fairly stranded and in need of significant outside salvage assistance, whether or not the ship has a double bottom. The Committee did not accept that the flooding of void spaces in a double-hulled ship is inherently bad -- in some cases that could work to stabilize the ship -- and could not identify salvage-related areas that should limit the use of a properly designed double hull. The NAS report notes that an informal survey of ship salvers found them to be in favor of double bottoms.

Fire Safety Concerns

Double bottoms and sides increase, significantly, the risk of explosive gases accumulating. There is no statistical evidence to support the view that there has been an increase in casualties, fires, or explosions on ships of these types during the last twenty years. Undoubtedly this owes much to careful monitoring and maintenance, which will be increasingly required in future.

Oil Outflow

Oil runs out of a damaged tank for as long as the pressure inside the tank exceeds the pressure outside. Roughly speaking, crude oil will stop flowing out of a tank ruptured below the sea level when the surface of the oil in the tank has reached the level defined in Figure 16.

If the ship is loaded to a point anywhere below the level shown in Figure 16, holing below the waterline will result in sea water flowing in and raising the cargo to the level of hydrostatic balance. There will be no cargo loss in ideal circumstances, but tidal or wave movements, or the turbulence created in high-impact collisions, will all lead to some loss of cargo. It has been proposed that the existing fleet should be operated permanently under hydrostatic loading principles. This would entail losing roughly 20% of existing cargo carrying capacity in each ship with obvious economic consequences. That, together with a number of technical and operational objections, has resulted in very little support for this idea. The mid-deck design employs hydrostatic principles without any significant loss of carrying capacity and suffers from fewer technical drawbacks. In contrast to tankers, tank barge design more easily favors hydrostatic loading, which can be achieved with less than 10% cargo penalty.

The NAS Committee compared the oil outflow from its test design/operation combinations to a tanker meeting current MARPOL requirements. For VLCC's, the

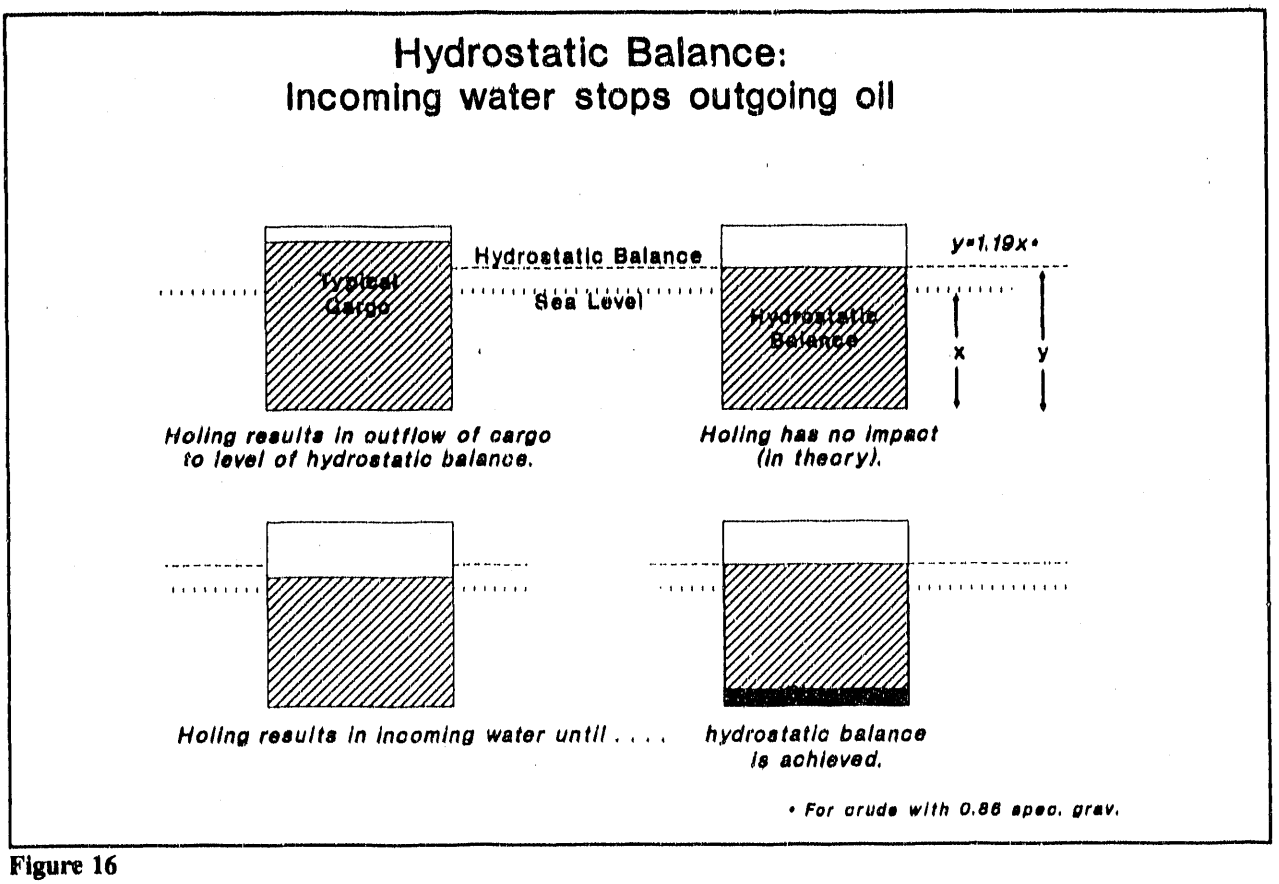


Figure 16

most effective designs were the double hull and the mid-deck, and the use of hydrostatic loading with double-hulled or double-sided ships. Each resulted in estimated oil outflow less than 30% of a current MARPOL tanker. For a small tanker (40,000 dwt), the test designs showed less impressive reductions, with the best combinations reducing oil outflow by 50-60%. The most effective design was the mid-deck. Its performance was surpassed by the use of hydrostatic loading in a MARPOL tanker, however. The tests were based on a combination of low energy (5 knots) and high energy (10 knots) collisions and groundings.

Maintenance

The new generation of tankers will require, without exceptions, more (and much more rigorous) inspections and maintenance. Corrosion is going to be a much greater threat. This is partly because design tolerances have reduced plate thicknesses for deck and bottom plates during the life of the currently retiring generation of tankers from around 30 - 35 millimeters to 20 millimeters, and high tensile steel has been substituted to a large degree for mild steel. (Unprotected, all shipbuilding steels corrode at the same rate -- approximately 0.5 millimeters per annum).

It is worth noting, in view of the above, that underwriters have said that hull insurance premiums will be higher for double-hulled tankers than for mid-deck tankers: the potential for gas build-up, and hence the risk of explosion, is higher in a double hull, as is the risk of corrosion between the hulls.

The scale of the inspection/maintenance problem can be illustrated quite clearly. On a pre-MARPOL VLCC, inspection of the tank area involves:

- 300,000 sq. meters (74 acres)
- 750 miles of welding
- vertical height climbed during survey: 35,000 ft.
- total inspection time: 2,000 man hours

The cargo tanks are usually the least susceptible to corrosion. Consider that the total area of ballast spaces to be inspected in a VLCC increases as shown in Figure 2.

But the most critical development has been the greatly increased opportunity for corrosion to take place, due to the much greater complexity of tanker design. SBT's can be particularly susceptible to corrosion; as can all the voids between double hulls (and double bottoms and doubles sides), and tank coatings must be carefully maintained. In general, the more nooks and crannies that exist within the structure, the greater is the degree of corrosion, the collection of explosive gases, and the degree of difficulty of inspection.

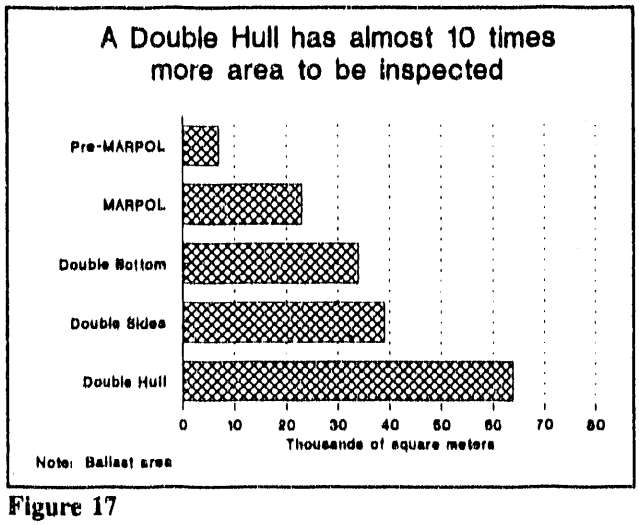


Figure 17

B. *International Developments*

The NAS study focussed attention on design alternatives. After a year of further study, in March 1992, the IMO's Marine Environment Protection Committee endorsed the mid-deck tanker as an acceptable alternative to a double-hulled vessel when it

announced its new standards and design. These require that for new ships ordered after July 6, 1993:

- Tankers over 5,000 dwt must employ either the double hull or mid-deck designs. Other pollution prevention methods can be used instead if the IMO subsequently approves.

- Tankers between 600 dwt and 5,000 dwt must have double bottoms.

For existing ships, effective July 6, 1995, crude tankers over 20,000 dwt and product carriers over 30,000 dwt must:

- at age 30 either be scrapped or retro-fitted to meet new ship standards;

- at age 25, be fitted with side or bottom protection over at least one-third of the cargo area, if they are the so-called pre-MARPOL tankers (those without segregated ballast tanks).

These amendments to Annex I of MARPOL 1973/8 will come into effect on January 6, 1993, unless there is overwhelming objection from the world's major ship-owning nations -- which is highly unlikely.

All the amendments have done, in effect, is to allow the IMO to keep its options open -- exactly the approach intended by the drafters of the OPA legislation. Very few mid-deck tankers are likely to be built, at least in the immediate future, but it does mean the tanker industry might not be locked into only one vessel design in the 1990's. Everything now depends on the Coast Guard.

The Coast Guard has participated in the IMO's research into the mid-deck design's behavior in various types of accident, and is generally supportive of the search for suitable alternatives to double hulls. At present, however, the Coast Guard has doubts over the IMO's research findings. The doubts focus on assumptions, critical to the test results, concerning oil outflow rates following a mid-deck tanker's hull being ruptured.

Double hulls will minimize the number of oil spills, but will mid-decks minimize the volume spilled?

According to the IMO model, no oil would be spilled from a double-hulled ship in 80% of grounding accidents, a far lower spill incidence than for other designs, but the mid-deck design is thought likely to lose less cargo from impacts sufficient to penetrate the inner hull of a double-hulled ship. If the IMO's assumptions are correct, the choice, essentially, is between minimizing the number of spills,

with a double-hulled fleet, or minimizing the volume of oil spilled, in the long-term, with a mid-deck fleet.

C. *Domestic Reaction*

The Coast Guard is now undertaking a further study of its own, to be completed by June. Then the results of three studies: the Coast Guard's, the IMO's, and the National Academy of Sciences', will be assessed, and appropriate recommendations will be made to Congress, via the Secretary of Transportation, by September.

Some 40 Members of Congress are pressuring the Coast Guard to reject unequivocally the mid-deck design. Some Congressmen see the IMO's decision as an effort to weaken U.S. law, although alternative designs are precisely what the law calls for (and U.S. law is not subject to IMO stipulations). They also suspect a plot by the Japanese to favor their own design and to "steal" orders and jobs from U.S. yards. There are two fallacies to this line of reasoning. Firstly, the first mid-deck designs originated in the U.S. Some Japanese yards may have more modern versions of the mid-deck design, and undoubtedly are better placed to start building them than the U.S. yards, but it is not because of any esoteric technological advantage. Secondly, no one except Jones Act operators, who have no choice, will build tankers of any design in the U.S. in the next few years. U.S. yards are not yet in a position to compete internationally. Thus any "loss" of orders cannot materialize.

It may be that the Coast Guard finds no acceptable alternative to double hulls, but if it does, it is to be hoped Congress is prepared to consider alternative proposals on their merits, and does not blindly deprive the tanker industry of opportunities for further progress in ship design and environmental protection.

Section II. CERTIFICATES OF FINANCIAL RESPONSIBILITY

A. *Introduction/Background*

The most immediate headache for all concerned in the transportation of oil to the U.S. is the future availability of COFR's. These are required by ships of all types trading to the U.S., not just tankers. They are issued by the Coast Guard on confirmation that the shipowner can meet certain financial criteria defined to offer assurance that, in the event of oil spills in U.S. waters, any claims against the responsible party can be met, at least up to a minimum level.

The Coast Guard is responsible for establishing the final rules governing issuance of COFR's, and has found itself in the middle of a storm of controversy. It is conceiv-

able, if unlikely, that its final ruling -- for which there is no mandatory deadline -- could halt seaborne trade to the U.S. This section describes the current state of affairs, and the impasse that has arisen.

B. *The Great COFR Debate*

1. The Problem

Before OPA, under the FWPCA, a tanker was required to demonstrate financial responsibility of $150/grt or $250,000, whichever was greater, which was done by means of P&I Clubs (see box) providing a direct undertaking to the U.S. Coast Guard to pay liabilities up to such amounts. There was no requirement to show financial responsibility in respect of the general maritime law liabilities.

OPA '90 increases a tanker owner's strict liability in the event of an oil spill eight-fold, to $1,200/grt; broadens the scope of recoverable damages to include all damages (not just clean-up costs); and extends the range of potential claimants from the Federal government to any party suffering direct or indirect losses as a result of the spill. At present, for a VLCC operating in U.S. waters, evidence of financial responsibility amounting to around $15 million is required (until OPA requirements are implemented). Under OPA, a COFR for a VLCC would require evidence of financial responsibility of around $120 million; for the largest tankers afloat, around $250 million. This is well within the range of cover offered by the Clubs.

The problem lies in the wording of key sections of OPA '90. The Act requires that:

> the responsible party . . . shall establish and maintain, in accordance with regulations promulgated by the Secretary, evidence of financial responsibility sufficient to meet the maximum amount of liability to which, in the case of a tank vessel, the responsible party could be subject under . . . this act. . . If the responsible party owns or oper-- ates more than one vessel, evidence of financial responsibility need be established only to meet the amount of the maximum liability applicable to the vessel having the greatest maximum liability.

Under OPA '90, financial responsibility may be demonstrated by

> any one, or by any combination, of the following methods which the Secretary . . . determines to be acceptable: evidence of insurance, surety bond, guarantee, letter of credit, qualification as a self-insurer, or other evidence of financial responsibility . . . the Secretary . . . may specify

P&I INSURANCE

The P&I Clubs

Some 95% of the world's shipping fleet including, effectively, all the world's tanker tonnage, has Protection and Indemnity insurance through membership in one of 17 P&I Clubs that form the International Group of P&I Clubs. The Clubs are mutual, non-profit organizations that insure members' liabilities. (Hull and machinery insurance, the other major component of ship insurance, covers loss of ship at sea, and is arranged through professional marine underwriters).

The Clubs provide shipowners with a wide range of services, including claims handling, and have an outstanding record of swift claims settlement, particularly in cases of pollution liability. With one significant exception -- the U.S. Water Quality Insurance Syndicate, which provides COFR's limited to $5 million for some small coastal and inland waterways carriers -- the Clubs provide virtually all the backing currently required for U.S. Coast Guard COFR's. The Clubs also provide insurance certificates required elsewhere under international law, to which the U.S. is not party.

How the Market Works

Each Club is liable for the first $2 million of a member's claim. The Clubs in the International Group then have a pooling arrangement to cover the next layer of claims -- currently up to $15 million -- and then re-insure the remainder. Total P&I cover is limited by the capacity of the re-insurance market. Currently, the limit is approximately $1.05bn. Pollution liability cover is limited this year, because of the potential for enormous claims under

> policy or other contractual terms, conditions, or defenses which are necessary, or which are unacceptable, in establishing evidence of financial responsibility to effectuate the purposes of this act. . . . Any claim for which liability may be established. . . may be asserted directly against any guarantor providing evidence of financial responsibility for a responsible party liable . . . for removal costs and damages to which the claim pertains.

The Clubs state unequivocally that this cover will continue to be available -- albeit at a higher price. But the Clubs refusing to accept direct action beyond the pre-OPA limits mean that this cover is useless as evidence of financial responsibility.

The Clubs have acquiesced to direct action in the past because liability limits were very much lower than under OPA '90, potential claimants clearly defined, and traditional policy defenses were available. The Clubs' principal concern is their exposure to unlimited liability. Though OPA '90 specifically states that no guarantor will be liable for amounts in excess of the guarantee, this offers little consolation, for two reasons. Firstly, the Clubs have a vague, but real fear that, in the event of a large spill resulting from gross negligence, U.S. courts would find a way around apparent limitations in order to gain access to the perceived "deep-pocket." Secondly, and much more specifically,

P&I INSURANCE (cont'd)

OPA and the tightness in the re-insurance market, to $500 million (plus an optional $200 million additional). Re-insurance is bought in several layers. Not all of the first $600 million layer could be placed this year, and in March 1992 the Clubs announced that they would re-insure the 7.5% ($44 million) shortfall themselves.

Inability to place all of the first layer of re-insurance does not mean that the second layer cannot be placed. The two markets may be quite distinct. Traditionally, the second, more remote layer, carries a much lower premium, precisely because the probability of a claim is so much lower. There has come a point, however, when the potential size of the claim from the worst-case spill weighs heavier in the minds of the re-insurer than the extremely remote possibility of its occurring.

For the 1992/3 year, this secondary layer seems to be just over $400 million (which brings the P&I total cover to the $1.05bn) and the premiums are far higher than in the past. In the event of a $2bn settlement against a P&I member, cover would be available as follows:

	$Million			
1) Member's Own Club	2			
2) Group Pooling	2	to	15	
3) Primary Re-insurance Layer	15	to	556	
4) Group Self Re-insurance* Layer	556	to	600	
5) Secondary Re-insurance Layer	600	to	1050	(approx)
6) Shipowner and other liable parties	1050	to	2000	

* Exceptional arrangement for 1992/3

many State laws do not recognize OPA limits; OPA '90 does not pre-empt State laws, as already stressed.

It appears unlikely that the Clubs will change their position on providing evidence of financial responsibility for any ship, of any type, calling at the U.S., once OPA requirements are to be met.

The Conference Report on OPA notes that "the Secretary may authorize other policy terms and defenses which are necessary or which are unacceptable in establishing evidence of financial responsibility to foster a continuing market for providers of financial responsibility."

In its initial Notice of Proposed Rulemaking ("NOPR") the Coast Guard addresses only insurance, surety bonds, guarantee, or self-insurance as acceptable demonstrations of financial responsibility. Though it requested comments on alternatives, the Coast Guard did not propose the use of "other evidence of financial responsibility" or the possibility, also mentioned in OPA, of meeting requirements through a combination of methods.

There is universal agreement that surety bonds are not a feasible solution, in terms both of cost and availability. Self-insurance, under the Coast Guard's proposed

rules, is possible only for a company incorporated in the U.S., that has both working capital and a net worth equal to, or greater than, the total applicable amount of financial responsibility required. Working capital is defined as U.S.-based current assets less worldwide current liabilities; net worth as total U.S. assets less all worldwide liabilities. The provisions are Coast Guard's assurance that sufficient assets to satisfy a claim will be under U.S. jurisdiction. The NOPR requires financial responsibility of $1,500/grt: the $1,200/grt under OPA, plus the financial responsibility requirements of CERCLA.

Certainly no purely shipping company can meet these self-insurance conditions. The American Petroleum Institute's informal survey of its members found that none of its respondents could self-insure either.

Under the NOPR there are no other alternatives. If the final rules are not modified, and the P&I Clubs remain adamant they will not be subject to direct action, no ship that has only P&I cover will be able to enter U.S. waters. (Some few companies might have sufficient financial clout to provide backing of some sort to an independent shipowner. What about the inclination?) There is no sign of a readily available alternative to the P&I Clubs emerging.

If the COFR rules were implemented as proposed, no ship would likely qualify for a certificate.

2. Proposed Solutions

An extremely intensive lobbying campaign to revise the Coast Guard's proposed rulings has been underway since last Fall. Both the shipping industry and the oil industry are involved. Four solutions are possible:

- OPA '90 could be re-opened and COFR requirements re-defined.
- The Coast Guard's proposed rules could be modified.
- The P&I Clubs, either in their existing format or in a radically revised one, will accede to direct access -- even though there is no incentive for them to do so.
- Alternative insurance schemes for vessels trading to the U.S. will supplement, or replace entirely, existing P&I cover.

Re-opening OPA '90 is the least likely alternative: Congress has no wish to do so, at least in the near term, and neither do the oil companies and some independent shipowners transporting oil to the U.S., for fear that the revision will be worse than the original. (A majority of the independent tanker owners, however, appear to favor re-opening).

There is considerable disagreement over how much leeway the Coast Guard has in implementing OPA '90's COFR provision. One set of proposed solutions is based on a legal interpretation of the Coast Guard's duties as *legislative rulemaking*, where Congress delegates authority to an administrative agency to adopt "regulations with legislative effect," as opposed to *interpretive rulemaking* where an agency merely attempts to construe the meaning of statutory provisions, instead of relying on its own judgment. The Coast Guard, quite clearly, sees its current role as an interpretive one.

Another proposed approach argues that there is sufficient leeway, even within the Coast Guard's interpretation of its position, to achieve a workable solution. The central arguments here are variations on the theme that the Coast Guard has proposed unnecessarily harsh and constraining criteria for establishing evidence of financial responsibility, in two areas in particular. Firstly, the Coast Guard, not OPA, established the draconian working capital and net worth requirements for self-insurance, and, secondly, the Coast Guard has ignored OPA '90's acceptance, in principle, of "other evidence of financial responsibility."

The most commonly proposed amendments to the corporate valuations are to admit worldwide assets into the calculations, and some argue for the working capital provisions to be dropped entirely. This "solution," however, would not help most of the international shipping companies to qualify.

Greek and Norwegian interests have proposed expanding liability insurance in general and meeting direct action clauses in particular. Neither scheme is yet available. See Chapter 5.

The oil industry and some shipowners argue to allow P&I Club membership as evidence of financial responsibility. The problem of direct action, which the Coast Guard can do nothing about -- it is OPA's requirement -- can be circumvented, proponents claim, by permitting a shipowner to attest to membership in a P&I Club, without evidence being supplied by the Club itself as a guarantor, and either a) treating such membership as self-insurance (the approach taken by the State of Virginia) or b) treating such cover as "*other evidence of financial responsibility*" (the approach taken by the State of California). Arguably, as long as the P&I Club itself does not provide evidence of financial responsibility for the responsible party, it would not be a guarantor and would not therefore be subject to direct action.

3. Current Standings

The Coast Guard will have none of this. It is convinced that the intent of Congress is to have a deep pocket behind every ship, in order to have clear and rapid access to substantial funds in the event of a spill. Unless such access is guaranteed, the Coast Guard is not satisfied, and maintains that OPA is not either. Nor is the Coast Guard inclined to accept the argument that the $1bn fund established from the 5¢/bbl surcharge on oil imports is always there as a back-up resource.[6] The Coast Guard insists (it believes on Congress's behalf) on direct accountability in all cases. There is the impasse. It is conceivable that the proposed rules on working capital requirements for self-insurance will be amended, or waived, and definitions of net worth are unlikely to be set in stone, but the P&I issue appears to be intractable -- with the current players.

Both the shipping and oil industries strongly favor, and are betting heavily on, the Coast Guard's revising its rules. The other options are regarded as extremely unlikely to materialize. This apparently blasé attitude towards what has been the most heatedly discussed OPA-related issue in the tanker market during the past 18 months might seem surprising initially, but it is realistic. Neither the P&I Clubs nor the Coast Guard are likely to change their positions without a great deal of pressure to do so. There is no statutory time constraint for a resolution, and in the meantime the Clean Water Act regulations still apply. Eventually, probably through environmental lobby pressure on Congress, rules must be promulgated. Those currently proposed will stop all but a handful of tankers, and virtually all other ocean-going ships, from calling at U.S. ports: not because shipowners find the risk unacceptable, but because COFR's will be unavailable. This result clearly puts the Coast Guard under far more pressure than the P&I Clubs, and explains the expectations that, ultimately, COFR's will continue to be available.

But though there are signs that COFR's will not be quite such an emotive issue in the future, new sources of excitement are poised to emerge.

Section III. NATURAL RESOURCE DAMAGE ASSESSMENT--A POTENTIAL SHOWSTOPPER

OPA'90 establishes a structure for evaluating natural resource damages incurred in OPA-covered oil spills, and charges the National Oceanic and Atmospheric Adminis-

[6] Collections for the Oil Spill Liability Trust Fund began on January 1, 1990 at 5¢/barrel (0.12¢/gallon) on crude oil and petroleum products. The tax is slated to end in 1994 or when the Fund reaches $1 billion; it will be reinstated if the Fund falls below its target level. It is to be used to pay Coast Guard's clean up costs in the event of a spill by an insolvent responsible party or a spill where there is no responsible party.

tration ("NOAA") of the Department of Commerce with writing and implementing regulations to assess them. NOAA is still drafting the regulations, which must be in place by August 18, 1992. Of particular concern is that the proposed inclusion of "nonuse" damages measured by "Contingent Valuation Methodology" ("CVM") may result in assessments so onerous as to impede tanker traffic, once the implications of the regulations are fully felt.

A. *"Damages" under OPA*

OPA's § 1002 specifies that liabilities include "[covered] removal costs" and the following "damages": natural resources, real or personal property, subsistence use, revenues, profits and earning capacity, and public services damages. The damages to natural resources thus exclude, for instance, losses to commercial fishing activities, revenue losses for seaside resort businesses, or tax collections which are impaired because of dampened economic activity. Each of these losses is covered under one of OPA's other named damage categories. The Natural Resource Damage Assessment ("NRDA") is intended, broadly speaking, to be the vehicle for recovering environmental damages on behalf of the public. A trustee of the appropriate governmental jurisdiction (Federal, State, Indian tribe or foreign government) is charged with the task of assessing and collecting the damages and implementing a plan for restoration or replacement.

Specifying damages to "Natural Resources," OPA'90 states:

> Damages for injury to, destruction of, loss of, or loss of use of, natural resources, including the reasonable costs of assessing the damage, which shall be recoverable by a . . . trustee . . .

OPA'90's § 1006(d) further states:

> In general--The measure of natural resource damages . . . is--
>
> (A) the cost of restoring, rehabilitating, replacing, or acquiring the equivalent of, the damaged natural resources;
> (B) the diminution in value of those natural resource pending restoration; plus
> (C) the reasonable cost of assessing those damages.

B. *Nonuse Losses*

The issue most hotly under debate as NOAA's regulations are being developed is the assessment of damages for "nonuse" losses. Nonuse value is the public's benefit deriving from the mere *existence* of a natural resource, separate from any actual uses

such as recreational activities or resource extraction that the resource might invite and support. The Department of the Interior ("DOI"), whose regulations under CERCLA will govern OPA's Natural Resource Damage Assessments until NOAA's regulations are final, has defined nonuse in its pending revision to the NRDA regulations by first defining "Compensable Value" as ". . . the amount of money required to compensate the public for the loss in services provided by the injured resources between the time of the discharge or release and the time the resources and the services those resources provided are fully restored to their baseline conditions. . ." "Nonuse value" is then defined as "the difference between compensable value and use value."[7] NOAA has not yet published a definition.

Nonuse value -- value derived from the mere existence of a resource -- arguably pertains only in the case of unique and irreplaceable resources (the Grand Canyon is often cited as an example), and losses occur, arguably, only when such resources are irreparably damaged. The "nonconsumptive" services provided by resources with close substitutes, on the other hand, are easily replaceable (a stream, for instance, which is one of many). Thus, not every spill should result in recovery of nonuse losses.

C. *Contingent Valuation Methodology*

1. Objective

Economists employ various well-established methods to quantify use losses. Estimating *nonuse* losses, however, is a subject of considerable controversy. DOI has proposed the use of CVM to monetize the value of the non-market goods deemed to have intrinsic (nonuse) value -- clean air, clean water, wildlife, etc. CVM employs survey responses to hypothetical questions to calculate respondents' "willingness to pay" ("WTP") to prevent or remediate pollution. Answers are then multiplied by the assumed affected population to arrive at the total amount to be paid. In the event of certain natural resources, the relevant population is postulated to be the entire United States. New Yorkers, Chicagoans, Houstonians, for instance, might all be asked how much they would be willing to pay to prevent a spill off the California coast. CVM surveys do not suggest that respondents will actually have to pay, either directly or through increased prices or higher taxes, the amounts they say they are willing to pay.

[7] 56 FR 19752, April 29, 1991. The Department of the Interior first implemented NRDA regulations under CERCLA in 1986. Its 1991 proposals were necessary to conform with a decision of the United States Court of Appeals for the District of Columbia in a case challenging DOI's rules, State of Ohio v. United States Department of Interior, 880 F.2nd 432 (D.C. Cir. 1989).

2. Objections

Many noted economists have questioned reliance on CVM, and even some CVM proponents doubt the methodology's efficacy for estimating nonuse losses. Drs. W.H. Desvousges and R.W. Dunford, on whose recommendation DOI included CVM for measuring *use* damages in the 1986 regulations, are among the doubters:

> . . . DOI has gone far beyond the guidance in the Economics Information Document [1987]. . . that accompanied the original NRDA regulations. Many of the contingent valuation references in that document were for measuring use values, which we think is a much more predictable process than measuring nonuse values. . . In addition, the nonuse references in the Economics Information Document . . . dealt largely with long-term or irreversible changes in resource services; many with unique resources; and all were in the context of *ex ante* values. With a damage assessment, there is a significant transition to *ex post* measures of damages -- often for short-term changes in ordinary resources. . .[8]

Appendix IV outlines several specific CVM studies that illustrate concerns raised by economists evaluating the use of CVM for estimating nonuse losses:

- *Small changes in questionnaire design can lead to ludicrous ranges of damage estimates.*

- *Because survey respondents are not required to pay anything, results are usually inflated.* For instance, in comments to NOAA, J.A. Hausman, a Professor at the Massachusetts Institute of Technology, stated:

  > . . . the least satisfactory aspect of CV arises because it is a hypothetical exercise not dealing with either real or familiar goods. A common empirical finding is a very large CV response in comparison to a respondent's income which arises because the respondent knows that he will not be required to make an actual payment. Also, in the limited cases where CV has been compared to actual behavior, e.g. spending on environmental causes, an extremely wide gap between individual responses and their actual actions is found.[9]

---

[8] W.H. Desvousges and R.W. Dunford, "Comments on the Proposed Revisions in the NRDA Rule Pursuant to the 1989 *Ohio v. Interior* Ruling," June 28, 1991.

[9] J.A. Hausman, Written Comments to Mr. Thomas Campbell, National Oceanic and Atmospheric Administration, December 20, 1991.

- *Respondents do not distinguish between unique resources with irreversible damage and generic resources with limited damage.*

- *Respondents may make a political statement rather than an economic one when stating their willingness to pay.* In comments to NOAA, two professors from the University of Rhode Island stated,

  > . . . CV can be expected to represent a "symbol" of respondents concern for the controversial subject, rather than a monetary value of the "specific levels of provision described" (i.e., damages from the specific losses in natural resource services) when CV is applied to controversial issues. Furthermore, given that public perceptions of environmental hazards of oil spills are far greater than scientifically established impacts, responses are likely to reject the injury description in favor of far greater, but only vaguely defined effects on the larger ecological system.[10]

- *Respondents cannot disaggregate the value of one resource from the value of a package of resources.* The single-subject survey (e.g. How much would you be willing to pay to preserve site X?) routinely results in higher WTP for X than an aggregated survey (e.g. How much would you be willing to pay to preserve sites X, Y, and Z?). (See Appendix IV.)

Dr. W.J. Mead, Professor Emeritus at the University of California at Santa Barbara whose specialty is resource economics, recently reviewed a number of CVM studies estimating nonuse damages. In an April 1992 paper he described three such studies which looked at potential visibility improvements in the Grand Canyon. His comments point out the problems with the use of CVM for assessing actual payments for natural resource damages.[11]

> . . . The numbers obtained by these three CV surveys illustrate the problems faced by all attempts to measure benefits by sampling public opinion when the benefits are presumably dominated by nonuse values. First, the range of "values" derived from contingent valuation, after various adjustments and data treatment assumptions

[10] T.A. Grigalunas and J.J. Opaluch, Written Comments to Mr. Thomas Campbell, National Oceanic and Atmospheric Administration, December 5, 1991.

[11] W.J. Mead, *Review and Analysis of Recent State of the Art Contingent Valuation Studies,* April 1992.

> are applied, is enormous. One study found average annual WTP for visibility improvements in the Grand Canyon to be $95/household per year. Another study found that visibility improvement in the Grand Canyon is worth between $1.30 and $3.60 per household per year. A third study found that comparable visibility improvements in the Grand Canyon are worth between zero and $0.50 per household per year. The differences are the result of different approaches to survey design and data analysis. The results imply that the discounted present value of visibility improvements near the Grand Canyon might range from zero to $10.39 billion. Recall that these reported values are for slight visibility improvements at the Grand Canyon for just a few days each winter.
>
> For these uncertain WTP estimates, what benefits are to be expected? Balson made extensive corrections in the visibility estimates claimed in prior studies and concluded that for the Hopi Point viewing station, visibility would increase from a median status quo range of 180.0 km, to 183.4 km, a 1.9 percent improvement. Is it reasonable to hold that the American people would willingly pay as much as $10.39 billion (present value) for this modest visibility improvement?
>
> As long as CV studies were purely academic, that is, not used to allocate public resources or to redistribute wealth following from court decisions, uncertainty of this magnitude was of little significance. Now, however, with the specter of the nation's scarce resources being allocated and wealth transferred in large chunks based on decisions using CV estimates, real money and real resources are involved with serious economic consequences. The substantial imprecision (variability) of CV estimates of nonuse value and resulting uncertainty then become intolerable. [References omitted].

In a recent Advanced Notice of Proposed Rulemaking, NOAA recognized the controversy and requested additional comments on the use of CVM,[12] and in April, established a committee led by Nobel laureates Kenneth Arrow and Robert Solow to advise on the issue. The committee's schedule may necessitate NOAA's missing its statutory deadline.

[12] 57 FR 8964, March 13, 1992.

OIL SPILLS: THE CAUSES

THE RECORD IS IMPROVING

	No. Spills Worldwide	Oil Lost (million tons)
1970-79	252	3.5
1980-89	91	1.2

Source: ITOPF

THE CAUSES STAY THE SAME

An analysis by Lloyds Register of Shipping of over 300 accidents involving spills of more than 30 tons from tankers of more than 10,000 dwt, found:

- groundings and collisions each accounted for approximately 30% of incidents, and 30% of volume spilled.
- Fires and explosions caused 10% of incidents but accounted for 35% of oil spilled.
- Structural/mechanical failure accounted for about 30% of incidents, 5% of oil spilled.

THE 50 LARGEST OIL SPILLS, 1960-89

Causes*	All Spills		10 Largest		Within OPA Jurisdiction	
	no.	000 tons	no.	000 tons	no.	000 tons
Collision	11	792	3	475	3	118
Grounding	13	693	2	215	2	64
Fire/Explosion	12	851	3	453	-	-
Structural/Mechanical Failure	12	653	2	322	2	130
Unknown	2	52	-	-	1	25
Total	50	3041	10	1465	8	337

Source: NAS/Lloyds Register

* There is little variation in cause between ship size, type, location, or year of spill, but only 10 of these spills occurred in the 1980's.

HUMAN ERROR MAIN FACTOR IN SPILLS

- More than half of all spills are due to grounding or collision -- HUMAN ERROR. Fires, explosions, and structural/mechanical failure are also often due to OPERATIONAL ERROR
- A recent study by the UK (P&I) Club -- the most extensive ever of maritime claims -- found that 58% OF ACCIDENTS WERE CAUSED BY HUMAN ERROR (crews, pilots, shoreside personnel)

PARTICULARLY IN THE U.S.

- In U.S. waters, which are notably shallow, groundings are the most common cause of spills and account for approximately two-thirds of volume spilled. Groundings and collisions together account for 85% of oil spilled in U.S. waters, according to the NAS study.

Section IV. OPERATIONAL CHANGES AND CONTINGENCY PLANS

Operational changes required by, or in some cases merely inspired by, OPA '90 have received less attention outside the shipping industry than ship design and insurance issues. Given that human error is the predominant cause of tanker accidents (see box), and that reducing such error is unquestionably the single most important contribution to spill reduction that can be made, any proposed operational changes deserve close scrutiny.

Of the OPA-mandated changes in tanker operations outlined in Chapter 3, potentially the most radical OPA requirement affecting operations is that tanker owners and operators must submit for Presidential (Coast Guard) approval comprehensive response plans for dealing, "to the maximum extent possible," with a worst case discharge of oil. The response plans have yet to be finalized. An advisory panel whose members include, *inter alia*, oil and shipping industry representatives, State officials, environmentalists, and Coast Guard personnel, has been developing spill response regulations. The panel's deliberations covered how to plan for a "worst case" spill, and what type and amount of containment equipment must be carried onboard tankers. Final regulations must be established by August 1992, response plans submitted to the Coast Guard by February 1993, and be approved and in place by August 1993. The chance of meeting the August 1992 deadline is slight, as the Coast Guard has re-convened its advisory panel.

A response plan will most likely entail an owner's or operator's membership in an approved response organization like the Marine Spill Response Corporation ("MSRC" -- see box). In addition, contracts will be placed with several of the regional co-ops that dot the coast such as: Clean Gulf (Gulf Coast), Clean Sound (Puget Sound), Clean Bay (San Francisco), which are well-suited to respond to a shallow water spill, where MSRC will not be responding. OPA accepts proof of contractual arrangement with a recognized spill response organization as evidence of an adequate contingency plan for handling major oil spills, but owners must also demonstrate their own ability to control smaller spills, and to this extent, at least, onboard operations and training procedures will have to be modified as a result of response planning requirements. OPA, however, specifies that following an approved plan is not a defense to liability. A great deal of emphasis has already been placed on training procedures but it is too early to tell how this section of OPA will affect onboard operations.

As with COFR's, the shipowner's position is complicated by the difference between State laws. As shown in Figure 18, 14 States require contingency plans, and only three of them move in tandem with Federal rules. In addition to the mind-boggling time and effort monitoring, and insuring compliance with, the different requirements of different states, there are several problems:

The Marine Spill Response Corporation

After the *Exxon Valdez* spill, the oil industry organized a task force to assess the nation's capability to respond to a massive oil spill, and found that there wasn't one. Therefore the Petroleum Industry Response Organization ("PIRO") was established, funded, originally, by 20 oil companies. In August 1990, PIRO was superseded by the Marine Spill Response Corporation ("MSRC") and the Marine Preservation Association ("MPA"). The MPA, which had 37 members by the end of 1991 -- oil companies, shippers and receivers of oil -- funds the MSRC but has no day-to-day control of operations. The MSRC operates from five Regional Response Centers, with strategically located sites of equipment and supplies. MSRC, under the direction of the Coast Guard, is to respond to spills beyond the capacity of local organizations. The spiller pays for the cost of the clean up, not the MPA. The MSRC will be available to execute the appropriate elements of an MPA member's response plan, and intends to be fully operational by February 1993.

The MSRC is not intended to usurp existing local and/or independent spill response organizations -- the idea is to employ such groups as sub-contractors and to undergo joint training procedures.

In addition to its logistical preparations, the MSRC is heavily involved in research projects, which will play an even larger role once the organization is fully established.

The MSRC has been the subject of criticism by some oil companies and shipowners. Some claim that its position in the panoply of existing response organizations is unclear, and that it tended to have a somewhat inflated view of its role and capabilities. Others questioned the wisdom of its initial orders for sixteen offshore response vessels, specifically the degree of concentration on water-oil separation capability, rather than basic oil gathering/removal capacity. (This last criticism may be deflected by an order of 26 barges, each capable of storing 20,000 barrels of recovered oil, which is imminent.) During the last few months there are indications that the oil companies, in particular, are prepared to make their views felt on MSRC issues (previously, the prevalent attitude had been one of maximum detachment from MSRC plans and operations.) Given the critical nature of the MSRC's role, continued close monitoring is vital: after all, effective spill response is the last hope of limiting the potentially unlimited.

Meanwhile a competitor to the MSRC has emerged. The National Response Corporation ("NRC") is gearing up to provide an alternative in the U.S. East Coast and Gulf Coast areas and inland waterway systems. Begun by Coastal and Phibro, its function will be broadly similar to MSRC's, but, the founders hope, cheaper. The NRC plans to modify twelve 180 ft. offshore work vessels to serve as skimming and primary recovery vessels. Eight of these will serve the Gulf Coast and four will be stationed at strategic locations along the East Coast. The NRC also has access to supply ships and high-powered towing vessels.

- Some requirements are impossible to comply with under certain circumstances. Alaska, for example, which probably has the most extreme requirements, says that tanker operators must have access to enough equipment to clean up 60% of the cargo within 72 hours. In rough seas, it is physically impossible even remotely to approach this target in the event of a large spill, no matter what equipment is available.

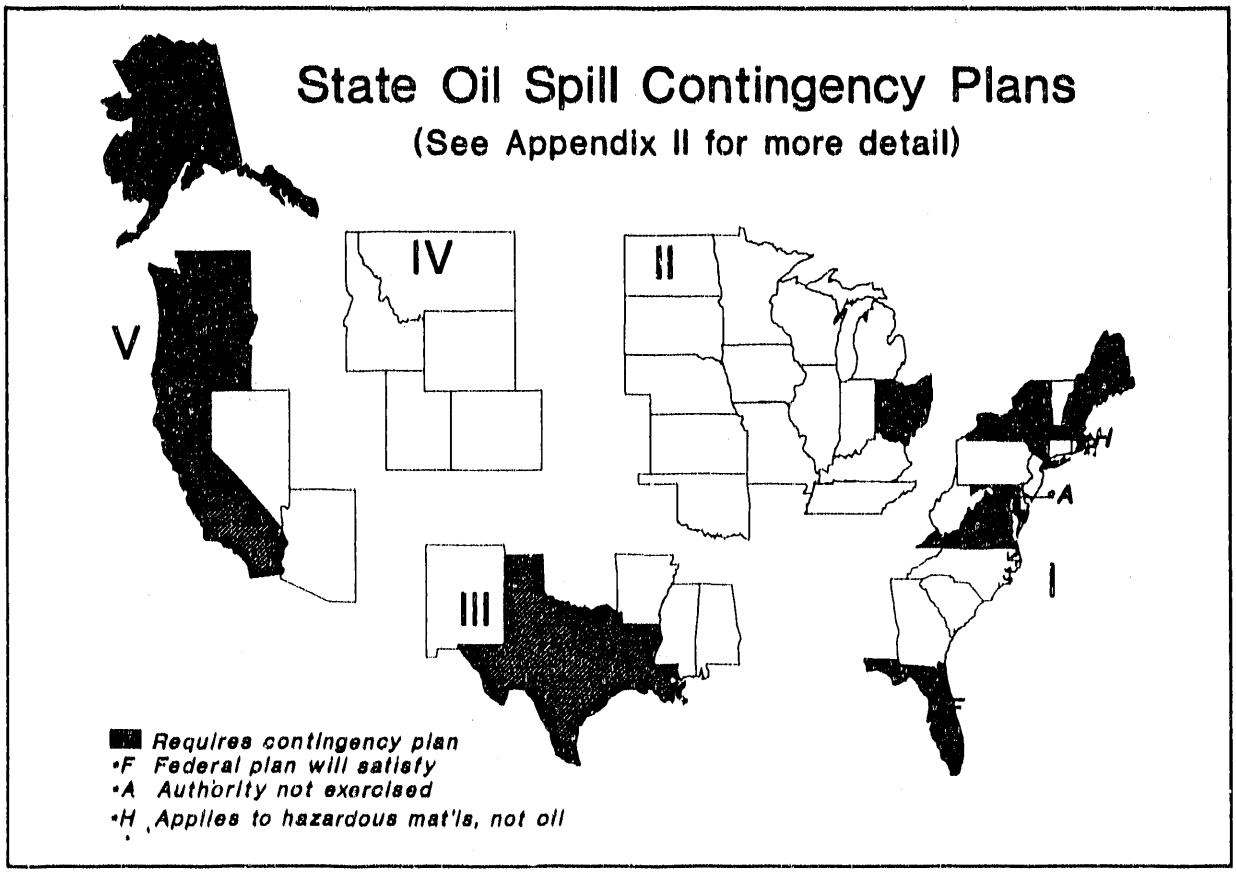


Figure 18

- The Coast Guard and the States are requiring redundant response capacity, so that when vessels and equipment are dispatched to a spill, the home port will remain covered. Coast Guard has proposed the retention of equipment adequate to deal with a 2,500 barrel spill, the "maximum most probable" volume that covers 99% of the spills recorded between 1985 and 1989.

- OPA requires national and area response plans to be developed in parallel with tanker response plans. Not only will regional plans vary, but chains of command in the event of a large spill, while theoretically clear, are likely to become tangled in practice, as national, regional, State, and corporate plans swing into action.

- There is, apparently, a great deal of politicking within the States themselves, and it seems that this, rather than the cost of implementing and monitoring contingency plans, might be the main threat to trade disruption in some States.

One major concern that applies to both State and Federal proposals is over requirements for containment equipment to be carried onboard tankers. Storage of large amounts of equipment on deck, and its subsequent deployment, could prove to be extremely dangerous. In the event of a major spill, a tanker's crew will have its work cut out meeting its primary responsibility: stabilizing the ship and its cargo. It is likely to be at least as effective, and less hazardous, to rely on specialist response vessels and crews. The exception is in the barge industry where booms and skimmers (which are only effective in calm seas anyway) might be usefully "warehoused" onboard.

The Coast Guard's draft proposals recognize the problem of onboard equipment storage: though some containment equipment will be required on each vessel, and certain deck configurations will have to be met, the Coast Guard acknowledges that it is safer and more effective to rely on response vessels for major supplies in the event of a spill. The Coast Guard is also trying to balance the needs of a practical solution with the various concerns of individual States, having made it abundantly clear that it would prefer to establish a Federal (OPA) rule that would obviate the need for separate State legislation. This is a noble goal with only some chance of success.

5. REACTIONS TO OPA '90

In assessing reactions to OPA, PIRINC interviewed tanker owners, oil companies, trade associations, ship brokers and insurers. The insights gained form the backbone of our analysis. Data provided by Lloyd's have augmented the anecdotal evidence with statistical evidence.

Section I. THE TANKER MARKET

A. *Statistical Evidence*

The vast majority of the world's tankers are employed, at some time in their lives, in the U.S. trades. This can be clearly seen from an analysis of Lloyd's Movements Data for the third quarter of 1991. During that period, 717 tankers, with an aggregate capacity of 64 million dwt, one-quarter of the world's tanker tonnage, were active in the U.S. oil trades, including coastwise movements. Of those trading to the U.S. in that period, 88% (56 million dwt) were foreign-flag vessels. Half of that tonnage made only one call, which shows that most vessels are not tied to a particular trade. (Some large tankers are employed long-term in dedicated long-haul trades and would expect to make only 4 - 5 calls annually in the U.S., but these represent only a small proportion of the ships in the movements analysis.) Thus, any fundamental changes to the operations in the U.S. trades will have a direct impact on much of the world's tanker fleet.

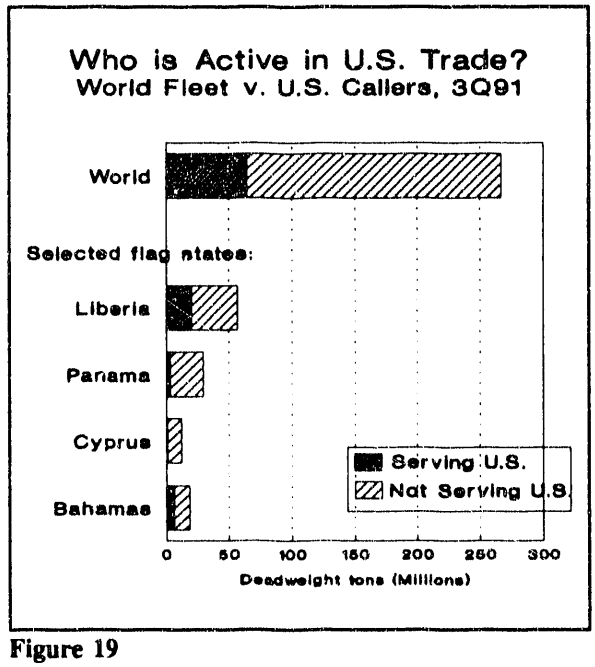


Figure 19

A central issue: Has the fleet of tankers serving the U.S. changed since the enactment of OPA? To answer the question, PIRINC analyzed Lloyd's data on ship movements in the third quarter 1989 and the third quarter 1991. PIRINC commissioned Lloyd's Maritime Information Service to provide ship-by-ship detail on vessel size, age, ownership, and flag state for port calls in each of the three mainland regions, plus LOOP and the transshipping and lightering region of the Caribbean. The results are shown in detail in Appendix V and this section highlights the main findings.

The central finding: Between 1989 and 1991 very little changed in the profile of vessels serving the U.S. One large U.S.-based company dropped out its owned vessels (but other evidence confirms it continued to charter in); calls through LOOP remained nearly at capacity; Caribbean volume dropped as dictated by the market, but the profile of tanker operations remained relatively unchanged; flag types were virtually unchanged. The fleet did show a reduction in average age, and a younger fleet will get retired more slowly under OPA. Because of the similarity between the two years' traffic characteristics, most of our discussion in this section will be about the profile of the 1991 fleet; only where there is a significant change will we compare to 1989.

Very few companies have pulled out of U.S. trade. Yet.

One word of warning is due over interpretation of the movements data. It is designed to reflect ship behavior, not cargo volume; many ships make several voyages and/or discharge at several ports over the 3-month period. In the graphs in this section, and in the Appendix, a ship has been counted only once regardless of the number of calls it made during the period. The exception is the regional data, where each ship is included in each region where it called; removal of the multiple calls would obscure regional traffic. The size ranges used for classifying the vessels coincide with those used in OPA '90 to define compulsory retirement ages from the U.S. trades, and are consequently in gross registered tons[13] -- but all tonnage figures shown are dwt.

1. Overview: The Profile of the 1991 Callers

As shown in Figure 20, 85% of the tonnage calling during the third quarter of 1991 was privately-owned, foreign flag tonnage. The largest share of this was flag of convenience (or "open registry") tonnage (flag states such as Liberia, Panama, Cyprus and the Bahamas). The "Other Privately-Owned" category includes a vast array of flag states, dominated by Scandinavian and Greek ships. U.S. ships, accounting for 13% of the tonnage, are employed in Jones Act trades -- either shipments from Alaska or

[13] A gross registered ton corresponds to 100 cubic feet and is a measure of a ship's internal volume. A deadweight ton is the maximum carrying capacity of a ship measured in long tons. A ship's deadweight includes bunkers, stores etc. For a tanker, cargo carrying capacity is approximately 95% of deadweight.

intercoastal or intracoastal movements. Thus the foreign flag ships carry imports, and the greater importance of the larger ships is a direct reflection of U.S. import patterns.

Discussed in Chapter 2 is the regional calling pattern evident in Figure 21. The traffic volume at LOOP and in the Gulf Coast again comes directly from the import patterns: the crude imports feed the refineries in the region. Figure 21 also shows average sizes for background. The LOOP vessels are generally VLCC's, and some West Coast ports can also take large vessels, but the average size of all tankers calling in the five regions in 1991 was 90,000 dwt. Excluding LOOP callers it was 73,000 dwt. The average size of crude tankers (loosely, but plausibly, defined as the 30,000 grt and over category) was 107,000 dwt excluding LOOP callers. The average size of LOOP callers was 294,000 dwt.

With the exception of LOOP callers, the vast majority of vessels called at mainland U.S. ports. A handful called only at the Caribbean, to transship or lighter before leaving the area, but the great majority of Caribbean callers subsequently called in the U.S.

Most tankers lighter in order to gain subsequent access to a mainland port, and do so fairly close to shore. The alternative is "lightering to extinction," when a VLCC or ULCC discharges its whole cargo, usually well offshore, into smaller tankers or barges.

Lightering declined slightly between 1989 and 1991. Part of this decline was market-related; the practice is expected to continue, and is likely to grow gradually. While there is some circumstantial evidence of a marginal increase in offshore lightering since OPA '90 was enacted, particularly in the U.S. Gulf, it is clear that the majority of tankers continue to call at U.S. ports.

Vessel calling patterns were virtually identical in the two periods, though there was some decline in the proportion of shipments through the Caribbean.

2. Age: The Fleet Got Younger

Of the 64.2 million dwt of tankers that traded in the U.S. in the third quarter of 1991, 15.9 million dwt discharged via LOOP, with the great majority of these only via LOOP (no other U.S. calls.) These vessels may continue to operate in this manner until 2015 under OPA. Similarly exempted are tankers that restrict their activities to lightering more than 60 miles offshore, in designated lightering areas, and those only discharging or transshipping at Caribbean terminals. In the 1991 sample period this accounted for an additional 5.5 million dwt. The remaining 43 million dwt of callers are subject to OPA retirement schedules:

- Of the U.S. flag ships recorded in 1989, only 11% would still be able to remain in the trade after 2005. By 1991 this had

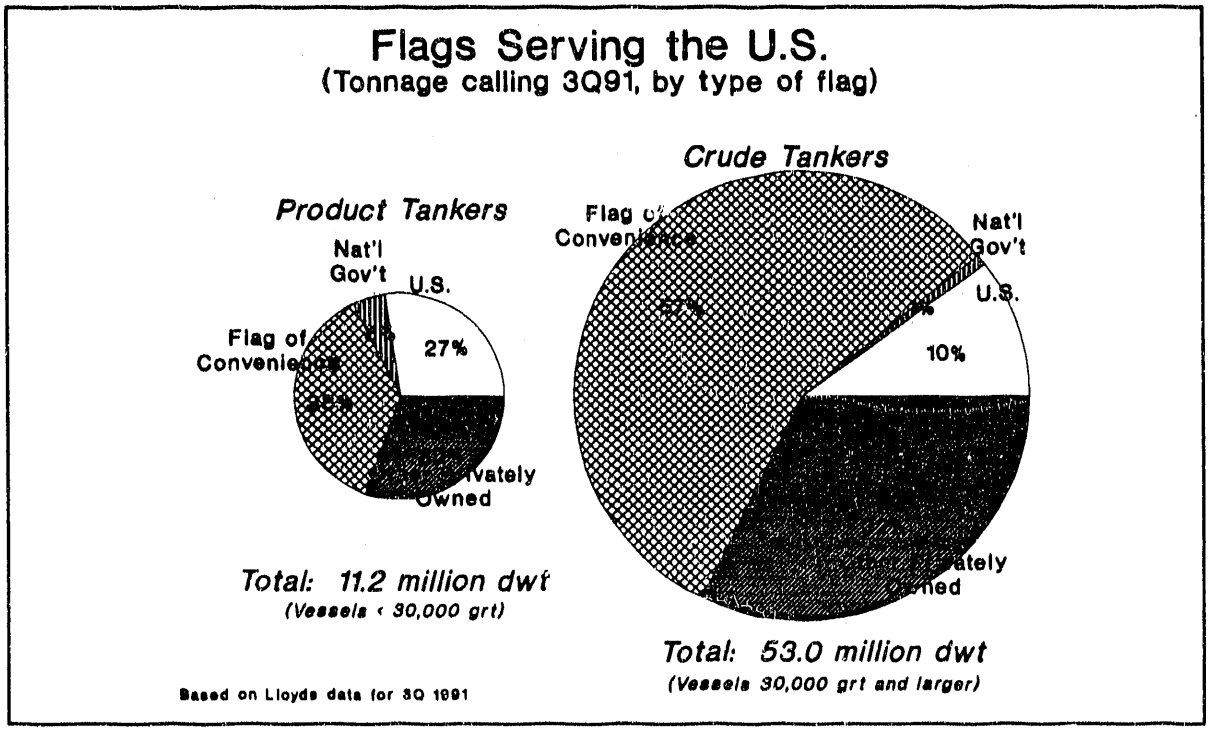


Figure 20

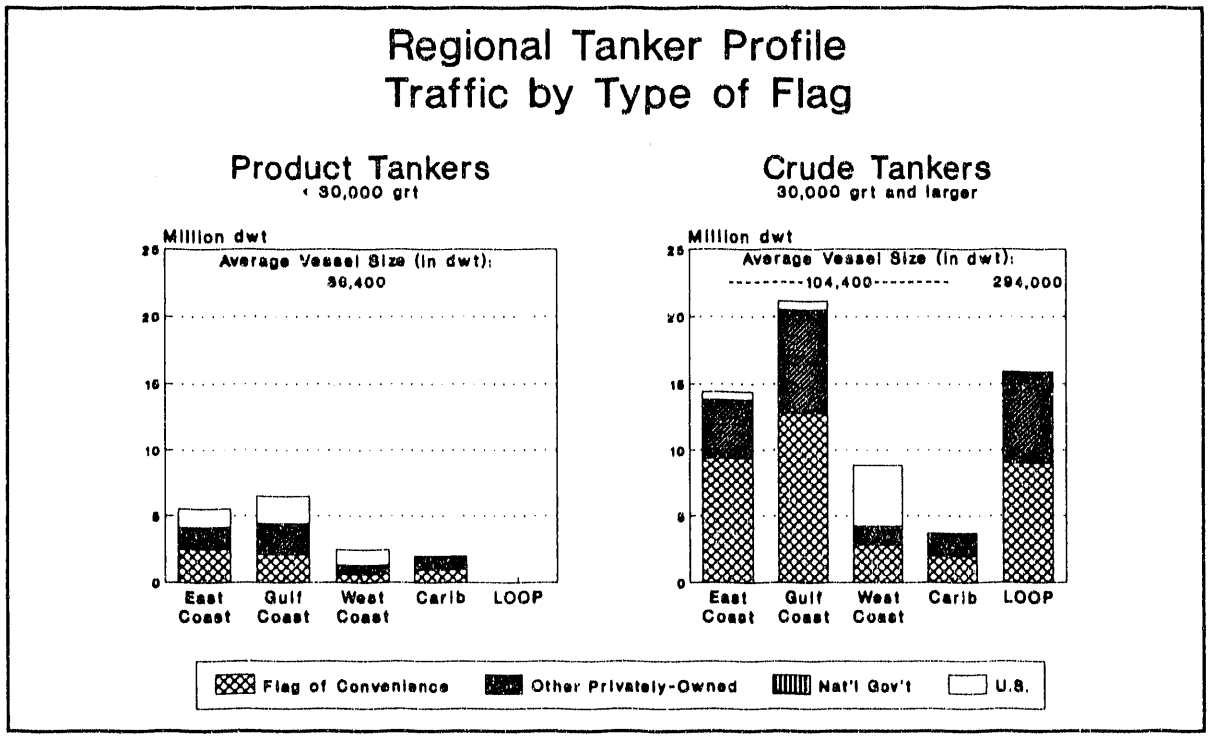


Figure 21

fallen to just under 10%. The U.S. flag sector is the only sector showing such a decline.

- In contrast, in the non-U.S. flag sector, 43% of U.S. port callers in the third quarter of 1991 would still be eligible to trade in the U.S. after 2005, compared with 32% in the third quarter of 1989, which shows that a significant influx of younger tonnage entered the trades since OPA came into effect.

- The proportion of flag of convenience vessels calling at U.S. ports that would remain eligible to do so after 2005 rose from 30% to 42%.

- The shift in age distribution occurred amongst East Coast, Gulf, and West Coast callers, and even, albeit less sharply, amongst LOOP callers. Only tankers calling at Caribbean terminals showed an increase in average age.

This refutes the "rustbucket" hypothesis (p. 67). Particularly impressive is the decrease in average age of LOOP callers despite the absence of regulatory pressure. In the eyes of many U.S. critics of the maritime industry, flag of convenience tonnage is regarded as unreliable, or second rate. This is generally a false representation, but if ever there was an opportunity for questionable ships to remain in the U.S. oil trades under OPA, a flag of convenience operation restricting itself to discharging via LOOP would be it. But between the sample periods the proportion of flag of convenience tonnage calling at LOOP that was built after 1982 rose from 10% to 19%. Admittedly the sample is small (37 ships in 1989, 33 in 1991), but it does provide first signs that OPA's objectives are being achieved.

3. Ownership

There is no statistical evidence to suggest that reputable independent owners with a substantial interest in U.S. trade are withdrawing. A comparison of the activities of 25 of the best known independent companies shows virtually no change in their U.S. trading habits.

The picture is remarkably similar for the oil company fleets. The most notable change between the two quarters of Lloyd's data is the disappearance of the non-U.S. flag fleet owned by a subsidiary of one of the U.S. oil companies. On a much smaller scale, in the third quarter of 1991 ships belonging to two non-U.S. oil companies discharged exclusively through LOOP, whereas two years previously a few port calls were recorded, but the amount of tonnage affected is negligible.

B. *Perception vs. Reality*

1. Perception

One of the great fears generated by OPA'90 was that it would result in an acute shortage of tanker tonnage to carry U.S. oil imports.

During the twelve months prior to the passage of OPA'90, there were dire warnings, predominately from the privately-owned tanker sector, which carries between 60% and 70% of U.S. oil imports, that the additional costs and uncertain physical characteristics of double-hulled tankers would deter owners from building such vessels as they became mandatory for the U.S. trades. Thus, replacements would not be available for mandatorily-retired tonnage during a period of rising import volumes.

These warnings were followed, and subsequently dwarfed by, claims that the greatly increased exposure to massive pollution damage claims in general, and unlimited liability in particular, would drive away reputable owners -- who would have considerable assets at risk -- leaving only fly-by-night "rustbucket operators" of one-ship companies prepared to run the risk of carrying oil to the U.S. So far, neither of these things has happened.

2. Reality

Now, there is very little controversy over double hulls. Over half of the orders placed for tankers during the surge in newbuildings since 1990 have been for double-hulled ships, despite the 15 to 20% additional costs. The majority of double-hulled orders have been placed by private owners, with some of the earlier orders being placed by some of the more vociferous early opponents of OPA'90 design requirements. The vast majority of independent owners operating in the U.S. before the passage of OPA continue to do so.

Though there is no sign of a mass exodus of tankers from the U.S. trades, the possibility remains. Decisions hinge on whether reason prevails during the final rule-makings currently underway (Chapter 4), and yet-to-come judicial interpretations. Meanwhile, insurance has skyrocketed -- both the level of cover sought, and its cost. Even during periods of depressed rates in the tanker market, when additional costs in some instances have had to be borne by shipowners, much higher levels of pollution insurance have been the rule.

The few companies that have left the U.S. trades, with much publicity, have done so not because of the expense of additional premiums, but because of the greater risk of incurring unlimited liability. More recently, in the case of some companies only marginally involved in U.S. trades, compliance with the still-growing array of State and Federal conditions has finally become too time-consuming to make the effort.

C. *Oil Companies vs. Independent Owners*

1. Oil Companies

When Shell International Marine and Elf Aquitaine announced in 1990 that they were withdrawing their owned or managed ships from delivering persistent oils to the U.S., except for deliveries via LOOP, the resulting publicity was out of all proportion to the actual event. Elf's move involved one ship: it remains an active charterer of ships, bringing oil into U.S. Gulf ports. And Shell's decision did not affect its U.S. subsidiary, Shell Oil, which is a major charterer of ships bringing crude to the U.S. Of the 144 thousand B/D previously carried to U.S. ports in Shell's owned or managed ships, approximately 100 thousand B/D went through LOOP in any case.

Strict, joint and several liability. But not against the cargo owner. So why are oil companies so worried?

The decisions by Shell and Elf were quite logical. The risk of exposing all corporate assets to unlimited liability, or even to years of legal wrangling alone, is simply not worth it for the small amounts of business involved. Even before Shell's and Elf's decision, ARCO had announced, with equal logic, that it would take the opposite approach -- commit to carrying all its own oil in double-hulled tankers each carrying $1.25bn worth of insurance -- citing the benefits of owner control for what is a core element of its business. Between these extremes, but far closer to the ARCO situation, lie the U.S. majors.

Based in the U.S., heavily dependent on imported crude, with large fleets of their own, the majors are at risk from any spill. If they chose to sell all their crude tankers and charter in tonnage instead, they would not, theoretically, be at risk under OPA, which excludes cargo owners and all but bareboat charterers from liability. But few believe that an oil company will escape with its resources intact in the event of a large spill by a small shipowner whose vessel it had chartered. In any case, charterer liability is included in several State laws, and cargo owner liability included in nine (see Figure 13 in Chapter 3). Only one U.S. oil company has fully substituted chartered ships for its own international fleet in order to carry oil to the U.S. Activities of its U.S. flag fleet are unaffected.

Thus the oil companies remain committed to carrying oil to the U.S., accepting the argument that, given the circumstances, maximum control of all aspects of oil movements is the safest bet. This does not exclude chartering, but it means that much closer relationships with, and more stringent requirements of, charterers is the way of the future.

Neither the volume of imports nor the tonnage to carry them has been affected by the few changes to the chartering policies of the large oil companies. As always, each

relies, to a different degree, on a mix of ownership, term-chartered tonnage and spot charters to carry oil into the U.S. (Overall, roughly 60% of U.S. oil imports are controlled by the majors, but only half of this is carried in their own ships). A desire for tighter control over marine transportation does not necessarily require a substantial buildup of owned ships. There has been an increase in term charters, as oil companies seek to secure good tonnage. 1989 saw the first 5 year timecharters in over 15 years. This trend is likely to continue, encouraged not only by OPA-induced decisions, but also by market pressures. As newbuilding prices rise, even owners whose predilection is for spot trading will be required to commit to long-term charters in order to secure financing. Nevertheless, the mix of term and spot chartering is unlikely to move outside historic bands. The degree of flexibility offered by the charter markets is vital in an extremely dynamic market.

"If you own the oil you transport it in your bottoms. And if you don't, you don't."

2. Independent Owners

The vast majority of independent owners appear committed to a continued presence in the U.S. trades. It is difficult to gauge attitudes accurately during a period such as this, when highly emotive issues remain unresolved. Individual owners, as well as their lobbying organizations, have many genuine fears in a number of outstanding areas, but positions are sometimes exaggerated. There are two good reasons for disregarding some of the more sensational threats of serious shortages as a result of recent pollution legislation. Firstly an analysis of tankers calling at U.S. ports in the third quarter of 1991 shows few differences from a similar analysis for the third quarter of 1989. Independently-owned tonnage predominates. Secondly during the second half of 1991, when one of the majors was known to be contemplating its fleet renewal strategy, several vociferous anti-OPA'90 Intertanko members -- large reliable companies -- continued to warn of the exodus of owners such as themselves even as they were actively seeking to interest the major in long-term charters for their new vessels (that would specifically involve regular shipments to the U.S.) in an attempt to persuade the company that this was a preferable alternative to a newbuilding program of its own. Thus, actions have belied words on more than one occasion.

The only independent companies to withdraw entirely from U.S. trade since OPA and tougher State laws were enacted have been either very small, or have had only a small interest in the U.S. oil trades relative to their other activities. For these the logic of Shell and Elf applies. The one large independent shipping company previously heavily dependent on U.S. oil trades that announced its withdrawal when OPA was enacted is again heavily involved in carrying U.S. oil imports and has several double hull ships on order.

D. *"Bluechip" vs. "Rustbucket" Operators*

But if ownership and chartering practices are unlikely to change significantly, the tanker industry is undergoing a sea change in its day-to-day operations, both onshore and onboard ship. Operational standards are higher, and will improve further. Ship standards are higher and will improve much further. Again, there is a tendency for words to exaggerate deeds, but here the difference is more one of time than direction. All charterers and owners claim, rightly, that prevention is better than cure, and that far too little emphasis is being placed on improved crewing and operational procedures, and on the physical condition of existing ships.

"A double hull does no good until an accident; let's prevent the accident."

All the oil majors have stringent inspection programs for ships that might be chartered. Some programs are more comprehensive than others, and some are more rigorously enforced, but there is little question that in all cases a great deal more care is being taken over quality control. Similar care is taken over appraisal of crews and operations; it is in the interest of both owner and charterer to minimize risks in this area. The question of what type of tonnage will be used to carry U.S. oil imports in future thus appears to be largely settled: the majority of vessels will be well maintained, operating to very high standards, owned either by an oil company or, more likely, an independent owner with a solid reputation and a close relationship with the charterer. (This assumes, realistically, that the COFR issue is satisfactorily resolved.)

Inevitably some will choose to run the gauntlet. A one-ship company, with a poorly maintained, fully written-down tanker with the bare minimum of mandatory insurance that is prepared to lose all its assets (i.e. one cheap ship) will always undercut the market, and there will always be takers. They are relatively scarce, and will be increasingly so, for a number of reasons.

- Few regular charterers would risk association with such ships: the political and financial risks are too high, and the whole approach is counter to the prevailing philosophy of the oil companies.

- Insurance costs are extremely high and cover for sub-standard ships will be increasingly difficult to obtain.

- The number of such ships even theoretically admissible to the U.S. trades declines as:

  (i) OPA's double-hull requirements are phased in.

(ii) Tough, comprehensive spill response plans are introduced. These require much planning and expense, and are likely to deter "dubious" operators further.

- Oil traders are becoming increasingly cautious in their chartering activities.

Characteristically, the trading community tends to tolerate higher risk, and the charter of a cheaper, less protected ship (physically and financially) would be a more acceptable means of boosting profits. But only up to a point. There are signs that many traders are becoming more conservative in their chartering habits; nevertheless, they still tend to be regarded as a higher risk group by much of the shipping and insurance communities.

The idea that traders would act as middle men, bringing in cargoes of crude to the U.S. under their own names and selling them, as prearranged, once they were safely discharged did not find much favor, despite a few early volunteers. The strategy has two constraints: the majors would be unlikely to be associated with such a strategy -- in the event of a large spill, the involvement of a major even under circumstances in which it was not directly liable under OPA '90 would almost certainly mean that it would be viewed as the "deep pocket of last resort"; and secondly, though cargo owners (the traders) are exempt from liability under OPA, they are liable, and for unlimited amounts, under some State laws.

E. *New Modus Operandi*

1. Route Restrictions

This is a difficult area to analyze: statistics don't cover the information and attempts at clarification by direct contact with owners and operators themselves are thwarted by the "wait and see" attitude inevitable since OPA, making current operating policies only temporary. With this in mind, the relevant observations are:

- Some large independents who specifically announced, in the summer of 1990, that they would not carry persistent oils to the U.S., and who did withdraw from the trade, have returned. Their ships are definitely calling at U.S. ports. Their return to the trade, unlike their departure, was unheralded.

- A few independents have withdrawn, some completely, some only from direct port calls -- restricting themselves to offshore lightering or discharging through LOOP. It is worth noting that the few independent owners that have stated unequivo-

cally that they will no longer carry persistent oil in their own bottoms to U.S. mainland ports, did not require a substantial change in operations as a result -- LOOP-discharging and lightering played a prominent role in their pre-OPA activities.

- One explanation given for a continued presence in the U.S. by some owners is that they are only meeting pre-OPA time-charter commitments before leaving the U.S. trades permanently. This is not convincing. If the threat of trading under OPA is so great, the cost of extricating oneself from a time charter would appear minute, particularly in the current weak market. This response may be interpreted as just a more aggressive version of the "wait and see" attitude.

There have been indications that the supply of quality tonnage is tightening, but nothing to suggest an overall shortage of tonnage either regionally or nationally. Lightering is more popular with a few companies, but the number of port calls shows no significant decline. There is no evidence of importers of oil having difficulty arranging transport to the U.S.

More surprising than the limited impact of OPA, so far, on the patterns of tanker movements to and around the U.S., is the equally limited impact of the tougher and varied State laws. The most frequently cited problems are in relation to the sheer volume of intelligence-gathering and administration involved. On occasion ships have been delayed from docking for 24 to 48 hours before appropriate paper work has been completed, but that seems to be the extent of the physical disruption -- again so far. Not one of the oil importing companies interviewed had withdrawn from a primary market as a result of recent changes in oil pollution legislation. Even withdrawals of owned ships were covered by charters, keeping traffic and volume unchanged.

Shipowners and oil companies are mildly optimistic over the prospects of achieving a more manageable *modus operandi* for dealing with State laws. Several States whose pollution laws were extreme, particularly in the areas of financial responsibility requirements and liability exposure, have subsequently modified their laws, or offered a far more practical interpretation of key statutes. California, Florida, and Virginia, are frequently cited as having a pragmatic approach to controversial issues and there is a growing sense that others may follow. There are also exceptions. Alaska and Maine are regarded as extremely difficult States to deal with.

One major oil company has abandoned a profitable shipping niche in the Alaska trade, after accepting tougher financial responsibility and contingency plan requirements than under OPA, and despite operating purpose-built, double-bottomed tankers, because it came to feel that the degree of politicking over oil spill issues within the State suggested that the bounds of reason were being surpassed. Again, it is the secondary

operations where the risk:reward balance is most disturbed, but this example does show that the perceived attitude of a State can have as much of an effect as its actual laws.

Maine is the only State that a significant number of first class shipping companies refuse to visit, and to date is the only State for which the "rustbucket argument" might be valid. It has lost a number of shipowners which formerly carried crude oil to Portland for transit to Canada, and a number of transporters of residual fuel oil. According to Portland Pipeline Corporation, 15 owner/operators had ceased calls in Maine as of November 1991. All but three of these continue to call at other U.S. mainland ports.

Transport of residual fuel oil has presented a special problem. Examples of companies withdrawing from residual fuel oil transport markets stretch from Hawaii to the East Coast, with companies unwilling to incur such high risks for a marginal business. Users continue to be able to get supply, however; at least one barge company has re-entered the Maine market and several companies have new barges under construction targeting the "black oil" market.

Other changes in ship deployment have occurred as re-structuring in the U.S. oil industry continues. These changes should not be interpreted, *prima facie*, as OPA-induced. Should such a change reduce company presence in a particular trade, OPA might persuade the company to abandon the remainder, as the risk:reward ratio shifts, but at most such developments would be isolated instances. An equally careful interpretation is needed of any decision by a shipowner to move international flag operations out of the U.S. There are two principal reasons for doing this. One is to establish joint-ventures with foreign partners, which combines the benefit of acquiring additional expertise with greater access to foreign capital. The other reason is to gain some degree of relief from the extreme (when compared with international shipping standards) measures of the 1986 Tax Reform Act. Vessels owned by these re-structured and/or relocated companies continue to trade to the U.S. under OPA.

2. Corporate Structures

Shipowners have re-structured their companies and created separate corporations -- either for each ship or for their U.S. operations exclusively -- in order to try and protect assets that have nothing to do with U.S. oil trades from future liability claims. (One good example is that of a foreign owner who operates a substantial lightering business -- shuttling oil from VLCC's and ULCC's to U.S. ports and refineries. Since OPA, the business is owned by a new U.S. subsidiary, listed separately on a foreign stock exchange.) Such re-organization is on a massive scale, even though there is no guarantee that the strategy will be successful.

In the great majority of cases on the other hand, there is little prospect that standards will be lowered. The increasingly close links between market participants -- shipowners, cargo owners, charterers, insurance companies, and their professional representatives and organizations -- that are now essential for trade to the U.S. are a far

stronger force for the maintenance of higher standards than the reduced exposure of a shipowner's global assets is for lowering them.

3. Safety First: The Quality Control Debate

On balance, OPA-induced changes so far have been to the good, even if they have not necessarily been achieved in the most cost-effective manner. While modifications to vessel deployment made, or planned, to date as a result of oil spill legislation will have no clear impact on U.S. petroleum trade, changes in operations onboard, at terminals, and in corporate offices, are likely to reduce significantly the incidence and effects of accidents.

"Safety first" is the paramount dictum under OPA.

Everyone acknowledges the need to raise safety standards, and all the evidence strongly suggests that the vast majority of owners and operators involved in carrying U.S. oil shipments have invested much time and effort in upgrading maintenance, precautionary operational and spill response procedures, and in many cases their capabilities already exceed OPA requirements: to paraphrase Dr. Johnson, "nothing focuses the mind so much as the knowledge that you could lose your company in the morning." A striking illustration of the level to which safety concerns have been elevated is that shipowners have begun to emphasize their efficient and safe operations in marketing to charterers. This is a novel approach in the shipping industry. It also provides further confirmation of widespread commitment to the U.S. oil trades.

Ship maintenance and operating standards, especially at the institutional and international level, have received a resurgence of attention. There is now something of a bun fight between classification societies, marine surveyors, flag states, port states, the IMO, Intertanko, insurers, (both hull underwriters and the P&I Clubs), shipowners, charterers and anyone else who cares to join in.

Ship design isn't everything. The Titanic, the newest and most sophisticated ship afloat, sank on its maiden voyage, and 2200 people were lost. It had a double bottom, but only half the required number of lifeboats.

The basic issue is whether one organization or group should have overall responsibility for ensuring that ship construction and operating standards are established and maintained, and, if so, who. Most of the problems concern monitoring. Shipowners frequently complain of delays in port while several inspectors, from different organizations or companies, clamber over the ship conducting identical inspections. Seven inspections during one port call seem to be the record to date.

QUALITY CONTROL: THE BASIC FRAMEWORK

Implementation of IMO conventions depends largely on the policies and attitudes of the numerous states of registry (flag states). The flag state is responsible, amongst other things, for certifying to port states that all insurance certificates are legally sufficient and valid, for licensing and supervising crewing, and, ultimately, for the structural condition of the vessel. Each ship's design, configurations, and construction is governed by the international agreements ratified by its flag state. Registries' commitments to their responsibilities range from the active, through the non-committal, to the fraudulent, and safety records vary greatly between flags. (See Figure 22). A flag state issues a 5-year certificate, for each convention to which the vessel complies.

Annual inspections are required to demonstrate standards are being maintained; a major inspection requiring dry-docking is mandatory every 5 years, prior to renewal of certificates. Additional flag state and port state requirements may be superimposed on international conventions, and monitored by a similar inspection schedule. Inspections may be carried out by government agencies, such as the Coast Guard, or by classification societies acting on behalf of the registries.

Classification societies establish standards and rules for design, construction, and the survey of ships. Traditionally class requirements cover the ship and machinery but not crewing and safety equipment issues, but this is beginning to change. There are more than 60 classification societies, some highly disreputable. Realistically, a tanker contemplating trade to the U.S. must be "in class" with one of the 11 leading societies that form the International Association of Class Societies (IACS). This means that it meets the continuing survey requirements of the particular society. Age and complexity of design increase survey requirements.

For the U.S., the Coast Guard requires each foreign flag tanker operating in U.S. waters to be inspected annually; these inspections are frequently carried out for the Coast Guard by the classification societies. OPA empowers the Secretary of Transportation to ban vessels from U.S. trades if their flag state is not maintaining, or enforcing, standards at least equivalent to U.S. laws (or to international standards accepted by the U.S.)

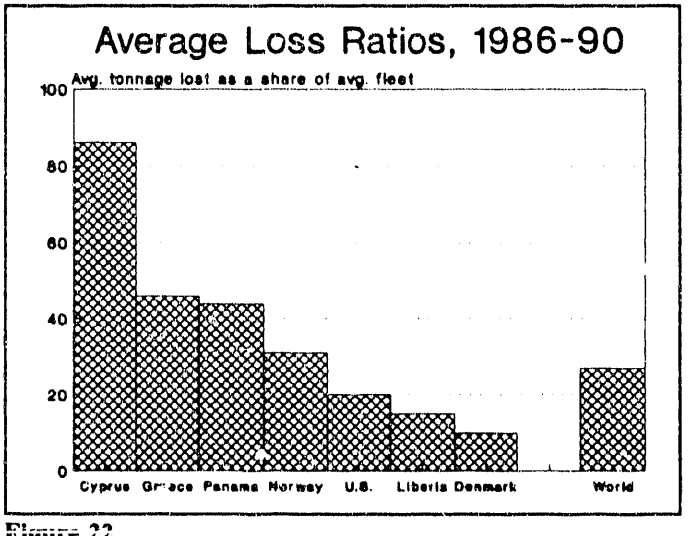


Figure 22

One large step in the right direction was made earlier this year, when the IMO ruled that special survey results should be made public, for the first time. Not only will this provide valuable information on a ship's structural condition to potential charterers, it will also, by increasing public scrutiny of their work, put pressure on the classification societies to maintain high standards -- an objective not always fully realized in the past in some societies. But special surveys do not reveal everything a charterer wants to know, and much more frequent inspections are necessary: not only to keep close track of the ship's physical condition, but also to ensure that whatever operational standards have been adopted are being maintained.

No one inspection program would satisfy every potential charterer, but an internationally accepted routine inspection should be able to reduce port delays resulting from multiple inspections dramatically. There are three main candidates for the role of "Super Inspector": the IMO, IACS, or the P&I Clubs. In all probability, the inspections would be carried out by classification societies -- they are the only ones with the resources to do so -- but an overseer is necessary, to ensure that competition between the societies does not result in standards being compromised, and to scotch any conflict of interest arising from the fact that, though inspections are for the insurers' or charterers' benefits, they are traditionally paid for by the owner. Given the recent decisions by the Clubs to exert greater control over their members' standards, the immediacy of their interest, and their close ties to all areas of the shipping industry, an argument can be made for their taking on the role.

Meanwhile, as the leadership debate continues, standards are continuing to rise:

- The P&I Clubs are undertaking far more research into the ultimate causes of past accidents, and are now monitoring individual ships and owners far more closely. The UK Club, for example, which covers one-quarter of the world's merchant fleet, has reduced the trigger age for its pre-entry survey from 15 to 10 years, increased the number of its inspection teams, and increased the scope and frequency of inspections of 10-to-14 year old ships -- apparently those most prone to accident. In addition, existing terms and conditions are being applied far more rigorously. It is now imperative that any owner or operator report all relevant defects to the classification societies as soon as they are discovered, otherwise liability cover will be withdrawn in the event of an accident, "whether or not the breach had causal connections with the incident giving rise to the claim."

- IACS members have made some sweeping changes: opening themselves to independent audits, and expanding their original interests, which were limited to the hull and propulsion of a vessel, to include rules of ship management and pollution

prevention. Some leading societies will now look to confirm, during classification surveys, that IMO safety and pollution prevention standards are being upheld. The IMO and IACS are working to establish a set of common standards for the societies' monitoring and surveying functions.

- The Joint Hull Committee, which represents the Institute of London Underwriters and marine insurers at Lloyd's, has introduced a "structural condition warranty" that requires owners to have vessels surveyed within a set time prior to renewal of cover (the survey would be done at the same time as the regular Class Surveys). In addition, hull underwriters are increasing scrutiny of client's operations, particularly of crew negligence, in the event of claims being made.

- In 1990, the "Group of Five" leading ship management companies introduced their "Code of Ship Management Standards," which aims, amongst other things, to raise levels of crew competency and introduce stricter operating criteria, as well as to persuade owners of the advantages of cost effective (as opposed to cheap) crews. The Code sets guidelines for both onboard and office routines.

F. *Summary*

At present it is safe to conclude, based on both statistical evidence and extensive interviews with oil majors, that there have been no signs of disruption to the carriage of U.S. oil import volumes. Neither oil companies nor independent owners who have changed their unloading procedures and locations have been subjected to major organizational disruptions, nor apparently have they delivered significantly less oil.

It is by no means safe to conclude, however, that this state of affairs will continue. Many issues raised by OPA are still to be resolved. How they are resolved will be critical. There is ample scope for financial and operational constraints to be introduced that will prove totally unacceptable to the majority of privately owned tankers companies. And there is equal opportunity for the Chinese Water Torture syndrome to take effect: more companies may withdraw simply because the sheer volume of regulations becomes too much to justify the effort to comply with them all. That was the principal reason behind the most recent withdrawal from the U.S. oil trades, by a Norwegian ship management company in May of this year. The threat of an exodus from the U.S. oil trades cannot be dismissed entirely yet.

Section II. OCEAN-GOING TANK BARGES

A. *Overview*

OPA'90's requirements apply to "tank vessels" whether self-propelled or not. Coastal tank barge owners and operators face the same difficult decisions as the tanker industry in the years ahead. Reactions to OPA and State oil spill legislation have already begun:

- several operators have announced the cessation of "persistent oil" -- *i.e.*, residual fuel oil -- transport to States with the most onerous oil spill laws (decisions that were clearly hastened by the eroding economics of the residual fuel oil market);

- several operators have ordered double-hulled ocean-going barges in recent months to begin the OPA-mandated process.

As reported to the National Academy of Sciences by The American Waterways Operators, Inc., the trade association of the barge and towboat industry, there were 310 tank barges in the fleet dedicated to coastwise petroleum transport, 99 of which were "ocean-going," *i.e.*, greater than 10,000 grt.[14] Of these larger tank barges, two-thirds were engaged in clean product trade. The remaining one-third carry persistent oils, including crude oil. Nine are equipped with double bottoms, and six are equipped with double hulls. Coast Guard data show that more than 70 were built after 1975, and only 4 were built before 1965.

Operational and design distinctions between tank barges and tankers translate into different pollution risks for the two types of vessels.

- Tank barges, even the ocean-going fleet, are generally smaller than tankers, and have smaller segregated tanks, so less oil is at risk in the event of a hull rupture.

- Clean, nonpersistent oils comprise a greater share of the tank barge fleet's cargo (largely because tankers, not tank barges, carry the crude oil, the major commodity transported by vessel).

- Because loaded tank barges have less freeboard (less distance between sea level and the deck) than tankers, they can use

[14] The American Waterways Operators, *The U.S. Oceangoing Tank Barge Industry*, A Report to the Marine Board Committee on Tank Vessel Design, April 6, 1990.

hydrostatic balancing to ensure that cargo loss is minimized in the event of a hull rupture.

- Tank barges routinely travel at half the speed of tankers, lessening the impact of groundings and some collisions.

B. *Operations Changes*

OPA'90's retirement schedule and operational requirements are just one set of regulatory mandates facing the barge industry in recent years. While tanker spills can be spectacular because of the larger volumes carried, barge spills get widespread local media coverage and regulatory attention, leading rapidly to changes in operations. The Environmental Protection Agency has required the installation of vapor recovery systems on barges, which as a side effect prevent spills caused by over-filling, and some terminals, in a new zeal for self-policing, require loading and unloading vessels to be boomed.

The necessity for safer operations has infused the tank barge industry as it has the tanker industry. Increased caution on moving in marginal weather and increased use of tug-assists are two examples. Training programs, too, have been stepped up in many companies, and now include shoreside personnel such as dispatchers.

Section III. INSURERS, FINANCIERS AND OTHERS

A. *Insurance is (Virtually) Everything*

Regardless of the degree of enthusiasm with which the enterprise is undertaken, in the post-OPA world, availability of adequate (massive) insurance cover is the *sine qua non* of continued presence in the U.S. oil trades.

The marine insurance market has probably just hit bottom. It is dominated by Lloyds and the Institute of London Underwriters (ILU)), through whose hands the vast majority of marine insurance passes, and whose current woes are well known. Lloyd's marine deficit was around $1bn (£550 million) in 1988, the latest complete accounting year, and is likely to be much more than that in the subsequent two years; and last year the ILU's $3bn (£1.68 million) of premiums received contrasted starkly with claims of almost $5bn (£2.73bn).

Traditionally, a year of substantial losses in the marine insurance market resulted in higher premiums and increased payments (calls) the following year. But the sheer scale of the recent losses, the apparent inability to increase re-insurance capacity even at much higher premium levels, and the increasing vulnerability of certain sectors of the

industry, is resulting in some fundamental changes in the insurance market. All of the forces for change were present before OPA '90 was enacted. OPA arrived just in time to exacerbate the issue by generating demand for far higher levels of pollution insurance, greatly increasing pressures on the re-insurance markets.

Re-insurance costs are a problem; re-insurance capacity is a big problem.

There are two basic insurance problems for shipowners: cost and capacity. In the long run, the rationalists still maintain, an increase in the former achieves an increase in the latter. In the last two years, however, the relationship does not appear to have held. P&I costs for many highly reputable owners have trebled since OPA was enacted, but in 1992, available P&I cover declined by $200 million, reducing to $1.05bn the cover available before triggering the need for Club members to contribute to a claim. The capacity reduction is thought to be temporary, but the difficulties in London could severely hamper future expansion in the near term. Over 90% of the first layer of the International Group's re-insurance contract is placed in London, less than 7% in the U.S. (and most of that is re-insured back into London). Unless the huge U.S. re-insurance market can be persuaded to become a major player in the oil pollution liability business, capacity constraints are likely to be a long-term problem, given the amount of cover sought by regular traders to the U.S..

Against this background some change is inevitable.

1. Revising the Old

All involved are now taking a far more analytical and cautious approach to marine insurance. Major pricing differentials are being considered for the first time -- though this might be a surprise to those unfamiliar with the marine insurance industry. In future, there will be much sharper differentiation between ship types, individual companies, and between geographic regions. See Chapter 6 for a discussion of U.S. insurance costs. And some insurance companies have even started to inspect the ships they propose to insure -- another revolutionary concept (and one strongly resisted in some circles as recently as 12 months ago).

Not all of the recent developments are due to OPA '90. For example, a series of total losses of large, old bulk carriers during the last three years was instrumental in focusing insurers' minds on the seaworthiness of older vessels, and planting the idea that closer monitoring of ship condition might be a Good Thing. But OPA '90's influence is clearly seen in the area of price differentiation. Owners with poor records always paid higher premiums. But that retroactive surcharge was all that existed except in times of emergency. Those shipowners offset higher insurance costs, presumably, by cost savings on operation and maintenance; higher premiums were not expected to influence market prices (freight rates). Prior to February 1991, the owners agreed premiums with their

P&I Clubs and were then covered for all trades to all locations. Then, the Clubs imposed a surcharge on all tankers trading into the U.S. That represented a significant change in the structure of P&I cover and set the stage for the first two-tier tanker market.

The combination of sharply higher costs, a reduction in capacity, and the uncertainty over the P&I Clubs' future role in the U.S. trade, given the unresolved difficulties over COFR's, has led to speculation that more fundamental changes to the liability insurance market will be required.

2. Introducing the New

Various schemes to augment, or replace, P&I cover have been discussed, but as yet no alternative seems feasible. The overriding problem for any market-based alternative is that it will face the same small world of marine re-insurance. An added difficulty would be the likelihood that the new body would be seeking to re-insure only U.S. oil spill liabilities -- the very worst element in the package of liabilities that the P&I Clubs are presently having such difficulty re-insuring.

This leads, ineluctably, to some form of government involvement in mandatory insurance schemes or, possibly, guaranteed cover. One such proposal has been made by the Greek Shipping Cooperation Committee (GSCC), which represents independent tanker owners. The GSCC sees a massive ($2bn) mandatory insurance program as essential, whether or not the COFR issue is successfully resolved, in order to:

- provide significantly higher cover than is available through the P&I Clubs.
- ensure rapid reimbursement to the Oil Spill Liability Trust Fund in the event of a large payout following a spill.

The majority of those involved in the transportation of oil to the U.S. feel that the Fund should feature more prominently in the various debates -- after all, it is there to be used. The GSCC argues that because the Fund is available without appropriation to pay first dollar claims not paid by the shipowner within 90 days, and because it acquires, by subrogation, a right of recourse against the shipowner under both Federal and State law, OPA's direct action provision is superfluous.

Premiums for the mandatory insurance would be established on a per voyage basis (because they would be so much higher than those covering other world trade) and reflect the volume of cargo involved. The problem of lack of re-insurance capacity would be overcome by some form of government supplemental cover that would bridge the gap between the amount of cover mandated and the amount commercially available.

Norwegian shipowners have proposed a similar, though purely commercially-funded, mandatory scheme, and are apparently optimistic that, under the right conditions, sufficient re-insurance capacity would be available, and that direct action would be acceptable for the mandatory cover. At present, this optimism is not widely shared.

Clearly, schemes such as these must be mandatory, and the cost must be passed through. But for there to be any chance of raising cover to the suggested $2bn, the U.S. re-insurance market must be attracted. That is no small order. If it were possible, and if insurers could be persuaded of the integrity and reliability of the insured, the remaining inducement to expand the insurance market would be financial: in the brokers' parlance, "the perfume of the premium would overcome the stench of the risk." Few, in the Spring of 1992, can smell the roses.

The perfume of the premium overcomes the stench of the risk.

B. *Other Parties*

1. Banks

Shipowners and operators are not the only ones requiring protection from pollution liability claims. Banks and other providers of finance could be exposed to unlimited liability if they are deemed to exert any influence on the management or operation of the financed vessel or even, in an extreme interpretation, merely in a position to influence management or operation of the vessel. Even if a bank avoids being labeled an operator, it still risks losing its loan security in the event of an owner's final liability exceeding his ability to pay (including his insurance cover). Banks may be able to protect themselves against this eventuality by acquiring "Mortgagees Interest Insurance Additional Perils (Pollution)," which covers the risk that a bank's mortgage would be primed (bumped) by pollution claims.

Some banks have been slow to take advantage of Additional Perils (Pollution) insurance. Some reacted to OPA '90 by insisting that shipowners take out as much pollution liability cover as possible, on the grounds that this provided additional distance between the potential claims and the bank's mortgage. There are two flaws in this attitude: firstly, it is extremely expensive to buy cover beyond the $700 million P&I maximum; secondly, it isn't guaranteed to work. The voluntary settlement for the *Exxon Valdez* spill would have exceeded mortgage cover by $1-2bn under the developing OPA '90 insurance market, even if the owner had $1bn of pollution liability cover. The insurance market is not even close to being able to guarantee the safety of a mortgage in this way.

Instead of forcing owners to buy hundreds of millions of dollars worth of extra cover, banks should buy the Additional Perils (Pollution) insurance, which simply covers the amount of the mortgage, at a fraction of the cost of the alternative, and pass the cost on to the shipowner: it's cheaper and it's guaranteed. Increasingly, this is being done. (The policy terms have gone through several revisions over the last year, but it is thought that a final version acceptable to underwriters and the banks will be agreed shortly.)

Other banks, or their clients, have balked at the cost (mortgage insurance premiums have more than doubled in the last year), and others have become disenchanted with their policies after leaving their shipowner clients to arrange some less than satisfactory mortgage insurance contracts for them in the past. But for the majority of the banks involved in ship finance who choose to remain active, Additional Perils (Pollution) insurance is now seen as essential, at least for newbuildings. Passed on to the tanker owner, mortgage insurance adds approximately 5% to the total insurance bill. A few banks have decided that the risk of association with a ship trading to the U.S. are too high and will no longer finance such a vessel.

In addition to mortgage insurance, banks have access to another $100-200 million of pollution liability cover, at a very high price, and, according to marine insurance brokers, there have been relatively few takers.

2. Finance Lessors

Finance lessors are very badly treated by OPA. They are far more vulnerable than banks because OPA imposes liability upon an owner and operator jointly and severally. A lessor is a registered owner and hence even though not involved in management or operation of the vessel will be liable. In short, OPA treats a finance lessor in the same way as it does an outright owner and not purely as a provider of finance. This is unrealistic, and in stark contrast to the treatment of finance lessors in the aviation industry. Lease financing of tankers is an area of tremendous potential growth in view of the volume of financing required for newbuildings over the next ten to fifteen years and the potential shortage of credit, but it has effectively stopped as a result of OPA except where perhaps the lessee is an oil major whose parent is willing to give the lessor a full indemnity. The risks are too high and the only available insurance is owner's insurance. If OPA were to be amended to acknowledge finance lessors in their true light, leasing exposure would be eliminated and insurance needs would be readily available.

3. Cargo Owners & Charterers

Two traditional sources of protection for cargo owners against third party oil spill compensation claims, TOVALOP and CRISTAL, have just been extended for 2 years, while the impact of OPA is further assessed. These voluntary arrangements came into effect between 1969 and 1971, to provide a second tier of cover once the first tier --

shipowner's P&I cover -- was exhausted. TOVALOP, the Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution, covers virtually all of the world's tanker tonnage, and makes available up to $70 million per incident to cover claims. CRISTAL, the Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution, whose membership includes most of the world's oil companies, supplements TOVALOP by a further $65 million when necessary.

In addition to industry sources of cover, commercial policies are available for cargo owners. In the past up to $1 billion was available, though this has shrunk more recently to $200 million.

The newest spill-related insurance product from the P&I Clubs is designed specifically to offer additional protection to cargo owners, who are named as financially responsible parties in the legislation of nine states, but not in OPA.[15] P&I Clubs have traditionally written cover for charterers, but this year one of the Clubs, Charterers Mutual, began to offer up to $100 million worth of cover to cargo owners: the first time this has been done.

[15] Though the initial decisions in the American Trader Case District Court for Central District of California in June 19, 1991 suggest that both cargo owners and voyage charterers might well be found liable under OPA whenever circumstances suggest they might be held to be 'operators' of a vessel.

6. FITTING THE PIECES TOGETHER

Section I. THE FUTURE TANKER FLEET

Availability of adequate tanker tonnage to meet rising trade volumes, particularly after 1995, depends on the newbuilding rate and, critically, the scrapping rate. Both are influenced in part by OPA, but more fundamentally by shipowners' general market expectations.

A. *Newbuildings*

1. The Total Order Book

At the beginning of 1992, 38 million dwt of tankers (of more than 10,000 dwt), and 1.8 million dwt of combined carriers were on order worldwide. Together these accounted for two-thirds of the total shipbuilding order book. Half of the tanker tonnage on order is for vessels of more than 250,000 dwt, whose activities in U.S. trades are restricted by their size to lightering, Caribbean transshipment and calls at LOOP.

Almost half of the tankers on order will have double hulls, and a large proportion of the remaining orders have options for double hulls, many of which are being exercised. This contrasts starkly with the existing fleet, just 5% of which is double-hulled, and proves beyond doubt that double hulls are here to stay.

Half of the tankers on order will have double hulls.

TANKER ORDER BOOK, 1/1/92
(million dwt)

Size Range '000 dwt	Total Tanker Orders	Double-Hulled Orders	% Double Hulled
10.0 - 39.9	2.46	0.01	-
40.0 - 79.9	2.68	1.31	49
80.0 -149.9	11.45	9.07	79
150.0 -249.9	2.29	0.31	14
250+	19.32	7.45	39
Total:	38.20	18.15	48

The ordering rate has continued at a brisk pace during the first quarter of 1992, though final confirmations are not yet available. The most notable order was by Vela (Saudi Arabia) for three 300,000 dwt tankers to be built in Denmark for 1994-5 delivery. The initial specification was for single hulls, with a double hull option available. The negotiations are currently underway for three similar tankers to be built for Vela in South Korea.

2. Double Hull Order Book: Emerging Trends

A look at the double hull order book, which also continued to grow during the first quarter of 1992, reveals some noteworthy developments:

Almost 80% of the 80 - 150,000 dwt tankers on order have double hulls -- a far higher percentage than any other size group. Most of the remaining double-hulled tonnage is in the 250,000 dwt plus category.

This pattern conforms to the two basic strategies confronting owners who choose to continue trading to the U.S. under the shadow of OPA '90. One is to carry the oil in as large a vessel as possible in order to maximize economies of scale, and never go near a U.S. mainland port. For these owners, discharging via LOOP or lightering are the principal choices. The other strategy is to commit to mainland calls, at least for a substantial proportion of operations, which automatically constrains maximum ship size to within the 80 - 150,000 dwt category.

The final choice between these two most popular size ranges depends in part, for an oil company at least, on its existing operational requirements, and in part on how owners see U.S. oil import patterns developing (Chapter 2). A bet on the continuing re-emergence of Middle East supplies would make VLCCs and ULCCs attractive -- doubly so to those wary of calling at U.S. mainland ports. Preference for a more flexible fleet, slightly less prone to the extraordinary swings in fortune experienced by owners of the

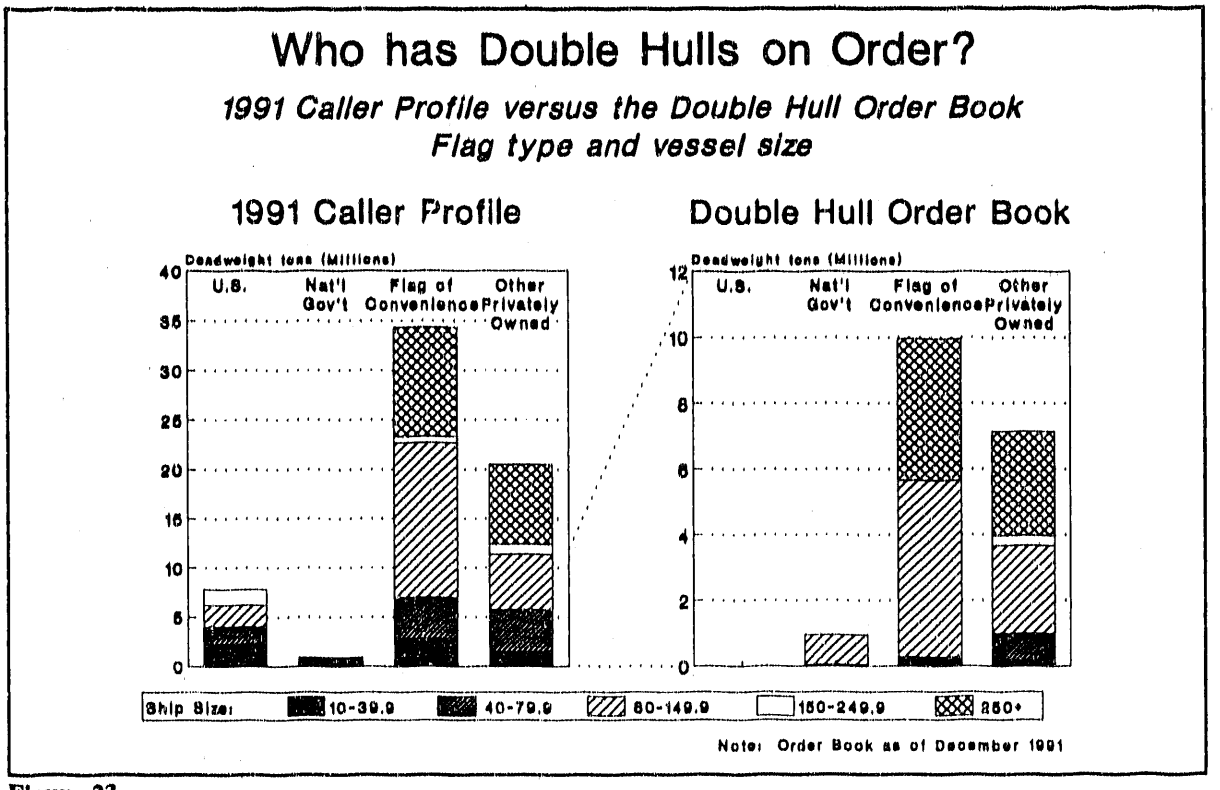


Figure 23

largest ships, favors the 80 - 150,000 dwt category: the smaller of which can trade virtually anywhere, and switch between crude and some product trades if necessary; and the largest of which still benefit from significant economies of scale, while having relatively few restrictions on their trading patterns -- and the important advantage of being able to transit the Suez Canal fully laden.

None of the vessels on order, regardless of hull configuration, are U.S. flag ships. It is well known that several companies -- oil majors and independent shipowners -- are interested in ordering new Jones Act tankers. These have to be built in U.S. yards, at a considerable premium to international prices. U.S. ship builders claim that the differential is narrowing, and in any case, protection from competition makes such a differential less critical; but the sheer scale of the investment, the anticipated long-term decline in Alaskan shipments, and the ongoing restructuring of the U.S. oil industry, have led to some extremely long periods of indecision over investments in new U.S. flag ships.

None of the vessels on order, regardless of hull configuration, are U.S. flag ships.

For the international trades, the chances of seeing a renascent U.S. flag tanker fleet are much more remote. U.S. shipbuilders argue that as tanker replacement demand strains existing shipbuilding capacity in the Far East and in Europe, prices will

rise to U.S. levels and double-hulled orders will come to the U.S. This is highly unlikely unless U.S. maritime policy is transformed in the next few years.

Non-U.S., independent owners loom large in the double-hulled order book. In the 80 - 150,000 dwt category:

- 42% of the tonnage on order is Liberian flag, and the further 17% is other flag of convenience orders.
- Only 10% of the tonnage is for government fleets.
- Of the remaining 31%, 19% is Norwegian.

In the largest size category:

- 54% is Liberian flag tonnage.
- Norwegian and Greek flag orders dominate the remainder, together accounting for 16%.

Just over 25% of the double-hulled order book at the beginning of 1992 was for oil companies: Conoco, Chevron, Ultramar, Amoco, Mobil and Vela. The Ultramar ships were recently sold to Indian and European buyers.

The ordering pattern must give further pause to those who argue that in future U.S. oil trades will be dominated by old, decrepit ships, operated by unreliable companies. The double-hulled order book lists the names of a large number of long-established operators with excellent reputations (and includes at least one of those who have sworn not to call at mainland U.S. ports while OPA's unlimited liability requirements remain).

One thought in the minds of those currently ordering double-hulled tonnage is that European and Japanese-style OPA's cannot be far behind, but the volume of such tonnage already ordered strongly suggests that this is not the principal reason behind the ordering: a commitment to continued trade to the U.S. has already been made, even under the current hazardous (for a shipowner) circumstances.

3. A Long Way To Go

There are two components to newbuilding demand: replacement demand and growth demand. Half of the current tanker fleet will be at least 25 years old by 2000, three-quarters by 2005. The combination of OPA and, particularly, the new IMO requirements for tanker standards (assuming they come into force) means that the vast majority of these ships will be scrapped, mostly after 1995.

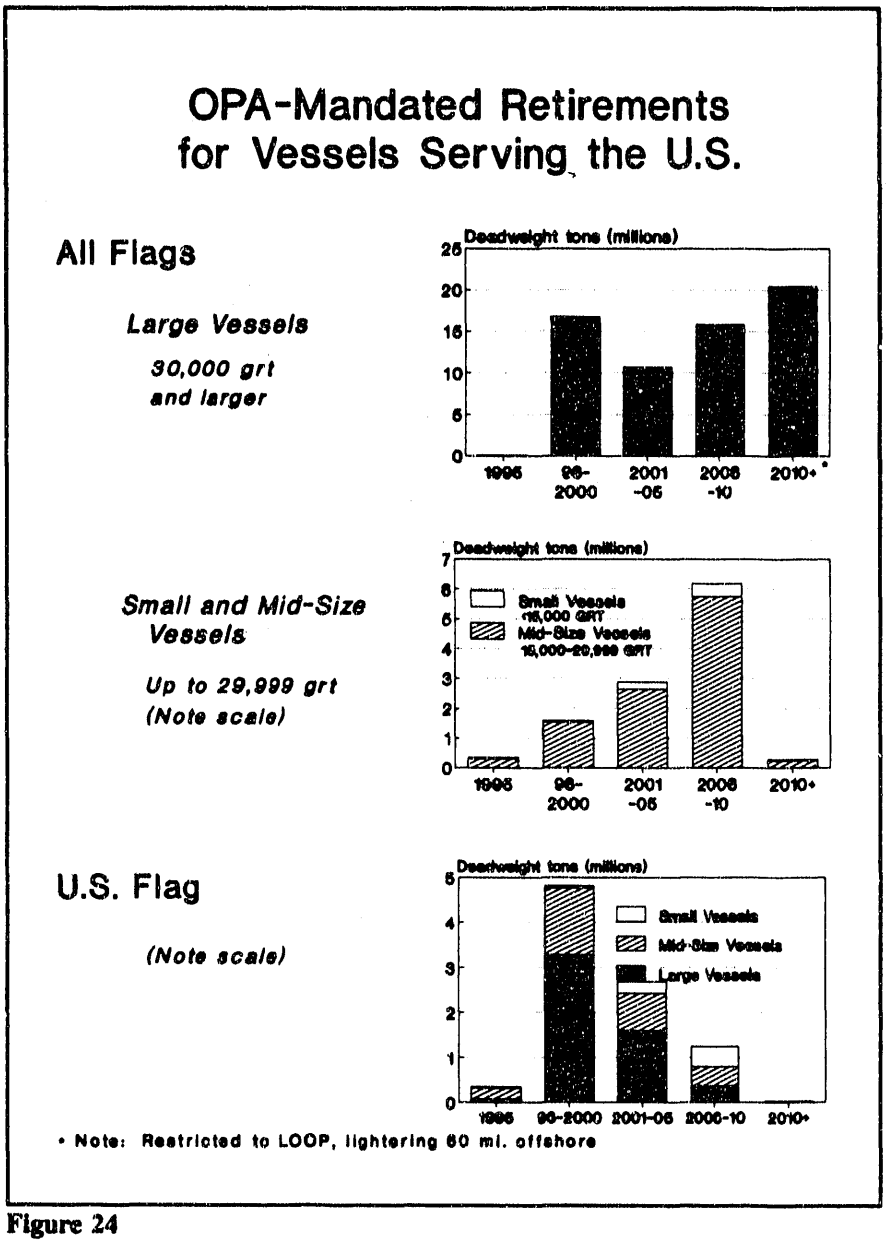


Figure 24

As discussed in earlier sections, the profile of tonnage mandatorily-retired under OPA echoes the age profile of the fleet and its calling patterns. Figure 24 illustrates that the age of the U.S. flag fleet removes it first. The vast majority of the foreign flag fleet of large tankers is a vestige of the building frenzy of the mid-1970's, and would be forced from the U.S. trades in the late 1990's and the early years of the 21st century but for the exclusions granted for LOOP and offshore lightering operations until 2015. While these vessels are shown in the later category in the graph, it must be noted that as their normal OPA "retirement" dates are passed, their activities in the U.S. will be restricted. (Given the size of most ships in this category, their past trading patterns, and the draft limitations of U.S. ports, this is not much of a restriction.)

The surge in scrapping will be huge, comparable to that in the early 1980's, when the volume of tankers scrapped peaked at a record 30 million dwt in 1985. (In contrast, tanker scrapping in the last three years, in total, was 6 million dwt). Scrapping rates have already started to rise in the depressed tanker market: 2 VLCC's were sold for scrap in the first quarter of 1992 -- the first in over a year -- and by May more tankers had been scrapped than in all of 1991, but escalation is likely to be slow over the next two years. Continued weakness in the freight market, increasingly stringent chartering requirements, and the growing reluctance of banks to finance life-extension projects[16] will keep the pressure on, but until legally required to do so, owners of good quality older tonnage are likely to be tempted to reap the benefits of relatively low cost operations. In addition, demand for scrap, and returns in the ship scrapping industry, have been chronically low for some years: this is not expected to change.

An indication of the relative strength of the components of newbuilding demand can be obtained with the following assumptions:

- Any growth in oil trades before 1995 can be accommodated without the need for further newbuildings. *Lloyds Shipping Economist* estimates the current tanker surplus at 36 million dwt; a further 39 million dwt currently on order will be delivered by 1995. These two elements could accommodate a 27% increase in demand over the next 2 1/2 years, which is unlikely. Nor are scrapping rates over the next two years likely to be sufficient to eradicate the short-term surplus.

- 75% of tankers that are 20 years old in 1995 will be scrapped between then and 2000. (It is widely expected that the tanker market will be returning to balance, because of higher scrapping, by, or shortly after, 1995).

- The 20 million dwt average annual scrapping rate thus suggested will generate an annual fleet replacement demand of 16 million dwt. (Replacement will not be ton for ton, as newer ships, and fleets, will be more efficient than their predecessors).

- Incremental oil movements from the Middle East to the U.S. are carried on the Cape route (to maximize the demand figure, for the purpose of illustration), and will require an additional 2.7 million dwt each year between 1995 and 2000. Over the same period, incremental movements from the

[16] Banks, in common with many others less familiar with the maritime industry, tend to attach too much importance to vessel age, too little to how well the ship is maintained and operated.

Middle East to Southeast Asia will generate annual tanker demand increments of 1 million dwt.

- Rising demand in other regions after 1995 will not add significantly to existing average voyage lengths, which suggests a net increase in tanker demand for trades outside the U.S. and Southeast Asia of less than 1 million dwt annually.

Under these assumptions, annual tonnage demand increases after 1995 will be just under 21 million dwt, less than one-quarter of which will be driven by trade growth. This makes very clear the tremendous potential effect of scrapping rates on the tanker market during the latter half of the decade. It is not known when the higher scrapping levels will be reached, nor how consistently they will be maintained.

In this respect, both the OPA and IMO requirements will be a significant force for the good, as at least a minimum "recycling" of ship tonnage is assured each year. An annual newbuilding demand in the region of 20 million dwt is more than twice the current rate, but will be well within shipyard capacity as long as the ordering rate remains fairly even. If, however, the fleet renewal program is largely postponed, by operating older tonnage as long as possible, or particularly by a large scale life extension program, the potential for disruption is enormous, both to the shipbuilding industry and the tanker market. It is conceivable, if not entirely likely, that the late 1990's and the early years of the next century could be a period of extreme volatility in both the tanker freight and newbuilding markets to which, as a contributor, OPA would play only a secondary role.

Section II. LEGISLATION VERSUS THE MARKET

A. *As OPA and State Legislation Evolve . . .*

OPA is almost two years old. It remains controversial. It has created some enormous problems, but fewer than the majority in the shipping industry feared. The most common evaluation is that while OPA is essentially a good idea, some aspects are unworkable, but negotiated solutions are possible without having Congress revisit the issue. A significant number the independent tanker owners would probably agree with the characterization of OPA as "An Evil Thing" -- an originally noble goal distorted beyond reason by overzealous politicians and environmentalists completely ignorant of the realities of U.S. oil requirements in general and shipping operations in particular. But no one disputes that OPA is here to stay.

Reaction to State legislation is a different matter. Here the minority verdict on OPA itself holds greater sway, for the same reasons. Several States have proved open to

negotiation, and have tended to work towards OPA provisions in controversial areas. Others have been more intransigent and could ultimately prove more disruptive to trade. Nevertheless, several oil companies in particular -- both major and secondary players in the U.S. market -- have professed a degree of optimism (some publicly, most privately) that in the end they will be able to reach workable arrangements with individual States. That is far from an ideal solution given the tremendous duplication of resources required to serve several masters instead of one, but that, too, will be the way of the world.

The chances are that OPA '90 will not be re-opened. Only some of the independent tanker owners want this; they would very much like to bring cargo owners more specifically under OPA's liability umbrella. But even there opinion is divided; there's a real concern throughout the oil and shipping industries that a revised OPA would be even worse than the original. Congress has shown no inclination to revisit the issue. A few well-placed Washington sources argue that OPA can be amended -- even improved, particularly with respect to pre-emption issues -- but none expect this to happen within the next several years.

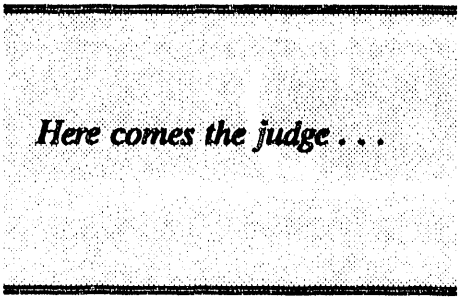
Nor does any harmonization of U.S. law with the existing (or revised) International Protocols governing oil spill liability and compensation seem imminent, despite OPA's note of Congressional Intent. More likely is the emergence of distinct European and Japanese OPA's, though there has to be a chance that, once these separate bills begin to take form, the horror of OPA '90's conceiving mutant twins might bring a truly multilateral approach to the issue back into favor. The possibility of revising the 1984 Protocols, as a first return step towards eventual global agreement on maritime pollution laws, is currently under discussion at the IMO.

What does it all mean? To this there can be only one answer: it depends. There are three non-market events that have the potential to have a profound effect on the transportation of U.S. oil in the future. The first two are the final rulings for COFR's and Natural Resource Damage Assessments, as decided by, respectively, the Coast Guard and NOAA.

The worst, and virtually inconceivable, result of the COFR deliberations would be a temporary stand-off between the P&I Clubs and the U.S. Government. The use of CVM for Natural Resource Damage Assessment, though highly controversial, is still viewed by many as a somewhat remote potential threat. This may or may not be correct, but as long as that perception remains, tanker capacity would always be available to carry U.S. oil. That perception would change overnight, along with a great deal else, should the third event occur: a major oil spill in U.S. waters.

The only good thing about such a spill would be that, eventually, everyone would know where they stood (in all probability, not far enough away). The final rulings on the various outstanding issues are unlikely to clarify matters much further: they will only finally be resolved in court, where everything will depend on the subsequent attitudes of State and Federal courts. Everyone in the oil and shipping industry acknowledges the

need for compensation, clean-up costs, and restoration to be paid after a spill, and virtually everyone can live with the larger amounts involved. But at the first sign of anti-industry bias or what is judged to be overzealous assessment of CV-calculated damages, the long-threatened exodus of tonnage from the U.S. oil trades is likely to begin. It would be temporary, until a workable compromise was reached between politicians, shipowners, and the oil industry, but the threat of real economic disruption would be genuine.



The chances of such a spill are extremely low. Higher operational standards and better ships and safety procedures should reduce the number of spills, and comprehensive spill response plans should reduce the volume lost in each incident. Undoubtedly spills will occur, but even then, the chances are slim that they will subsequently devastate vast tracts of pristine environment (a very high cost scenario). This means, of course, that tankers trading to the U.S. must continue to operate, probably for a long time, with a far greater degree of uncertainty than they face elsewhere. And apparently, this has been accepted.

Possibly the greatest disruption to traditional patterns of oil imports comes from State legislation. This is not a threat of catastrophe so much as a threat of an expansion of inconvenience for all concerned. This results from both an unnecessary duplication of procedures as well as differing procedures and standards between States and between States and the Federal government.

While substantial progress has been made towards minimizing the "State level" threat, some States are famously intransigent. One current example of potential overkill is the intention of some States to consider separate ship inspection programs to those acceptable to the Coast Guard under OPA.

Efforts to minimize similar instances would be worthwhile. Shipowners are far more likely to restrict patterns within the U.S. trading area than they are to withdraw altogether. And while these instances might not have a significant impact on the availability of imported crude, logistics and distribution costs could be seriously affected.

B. *Costs Rise for Shipowners and Consumers*

1. Costs Soar

As a result of OPA '90, shipowners face increases in both capital and operating costs. Capital costs are increased principally by the additional expense of a double-hulled ship, but additionally by marginally higher financing costs. Some owners will incur

a more modest, short-term increase in fixed costs, should they opt to extend the lives of existing ships. (Retro-fitting of double hulls is unlikely to occur.) Operating costs are increased through implementation of stricter operational procedures, repair and maintenance programs, more complex contingency planning, and, particularly, higher insurance costs.

Although operating costs have risen rapidly, capital costs will be the big ticket item under OPA.

A double hull adds 15-20% to new building costs, anywhere from $15-$25 million for a 1992 - built VLCC. This would add approximately 25¢/bbl to the cost of Middle East oil delivered to LOOP (Figure 25 illustrates various key cost increases.) Corresponding increments for Nigerian oil shipped to the East Coast in a 100,000 dwt tanker and Venezuelan oil shipped to the Gulf in a 60,000 dwt tanker are 13¢/bbl and 8¢/bbl respectively.

OPA '90's impact on operating costs is less spectacular, inevitably: operating costs are typically one-third of the annualized capital cost for a modern 60,000 dwt tanker, just below 30% for a VLCC. The critical difference for shipowners is that OPA-induced operating costs are being incurred now, while the higher capital costs are incurred more slowly, as the mandated phase-in of double-hulled vessels progresses.

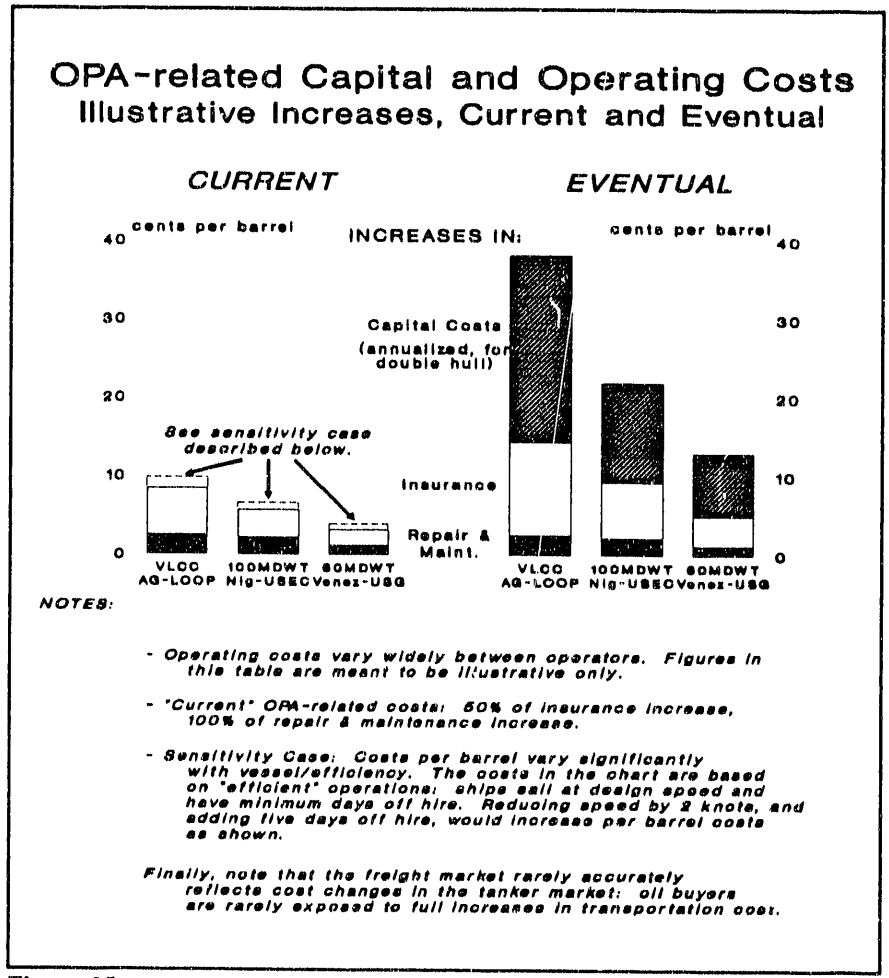


Figure 25

By far the greatest impact of OPA on shipowners' costs, so far, has been the massive increases in P&I premiums for tankers trading to the U.S. The complexity of the insurance market and significant differences between the operating philosophies, standards, and historical records of shipowners,

mean that it is impossible to define one representative increase in P&I costs for the tanker industry. An owner's P&I costs comprise a basic premium, which varies according to reputation, ship type, and past claims, plus various additional premiums and charges. The P&I Clubs pass on increases in re-insurance costs to members, and these have been particularly steep in the last two years. Tanker owners' basic re-insurance costs rose from 57¢/grt in 1991 to $1.40/grt in 1992, and the surcharge for each U.S. mainland port call rose from 32¢/grt to 41¢/grt, and from 16¢ to 20.5¢/grt for calling at LOOP (though a cap comes into effect for frequent callers). At 41¢/grt, the U.S. mainland surcharge is about 3¢/bbl.

The cost of the optional $200 million excess liability cover, a flat 13¢/grt when it was first introduced two years ago, now also takes into account the number of U.S. calls. For a tanker making up to ten U.S. port calls annually, the cost of the optional excess cover was $1.75/grt in 1991, and has risen to $2.00/grt this year (though a 10% discount is currently available!).

Finally, owners are subject to additional charges (calls) from their P&I Clubs, as necessary, to cover underestimated costs from prior years. Such calls have been a regular feature in recent years, and one of the objectives of the sharp increases in premiums in the last two years is to curtail the size and frequency of these calls in the future.

For a reputable shipowner with a modern fleet and excellent safety record and who trades regularly to the U.S., the various increments resulted in a 30-50% increase in P&I costs last year. That followed a much steeper increase the year before, when costs rose by around 100% on average, though by up to 300% for some owners. This was on top of increases of similar magnitude for hull and machinery premiums -- typically the larger element of insurance costs.

At $1 million, the increase in insurance premiums for a VLCC on the longest route amounts to 10-12¢/bbl.

Insurance costs vary enormously among owners, but to try and give an idea of the scale of the increase in the cost of pollution insurance, a modern VLCC in 1990, traded regularly to the U.S. by a first-class owner, would have been likely to have incurred an annual P&I cost of $200-250,000 including $700 million pollution liability cover. For 1992, the premium could easily be in the $750,000 to $1 million range.

Thus, for a modern VLCC trading regularly to the U.S., current annual insurance costs are more than $1 million above 1990 levels, split evenly between hull and machinery and P&I increases (That adds in the region of 10-12¢ to the cost of a barrel of oil carried in a VLCC from the Arabian Gulf, via the Cape, to LOOP.) For an 80,000 dwt tanker, the increment would be around half that for the VLCC. Total insurance for a double-hulled tanker is slightly higher than for a single-hulled ship of the same size --

any small reduction in the P&I premium being more than offset by a higher hull and machinery premium.

The other significant element of operating costs affected by OPA '90 is repair/ maintenance. Repair and maintenance of a double-hulled tanker will be almost twice as expensive as for a modern single-hulled ship, according to figures used by the National Academy of Sciences (Appendix III), but again this will not affect all ships immediately. All ships trading to the U.S. are likely to be spending more on repair and maintenance anyway.

For an admittedly somewhat arbitrary attempt to quantify the impact of OPA '90 on the costs of transporting the U.S. oil imports, assume that OPA was responsible for:

- All incremental newbuilding costs of double-hulled tankers;
- 50% of the increase in insurance costs during the last two years;
- All increased maintenance and repair costs.

Based on 1991 oil import patterns and ship size distributions, the weighted average cost increment, given the above assumptions, would be in the region of 25¢/bbl. Of this increment 6.0¢/bbl would be felt immediately, as it results from increases in insurance and maintenance costs.

There is no guarantee that these costs will be reflected in freight rates. Though charterers frequently agree to foot the bill for additional insurance costs incurred trading to the U.S., the general level of freight rates is dictated by supply and demand.

2. Freight Rates Bide Their Time

Even if OPA or State legislation proves no more disruptive in the future than it has been so far, the costs of carrying oil in U.S. waters will continue to rise, principally as a result of higher capital costs as double-hulled ships come to predominate. A two-tier market for tankers trading to the U.S. is likely to emerge, but it may be for a relatively brief period, for two reasons.

Firstly, it will be slow coming. The current oversupply of tonnage is likely to continue for another 2-3 years, until scrapping accelerates dramatically. As (if) balance returns to the tanker market, rates will rise towards levels necessary to provide owners of modern, double-hulled tonnage with an economic return on their investment. At the same time, a tighter market will raise fears among charterers with long term oil supply requirements that adequate tonnage may not always be readily available. To secure such tonnage, charterers commit to longer charters, at premium rates, and the two-tier market emerges.

But, secondly, the two-tier market in the U.S. will last only until either the Europeans and the Japanese introduce OPA-like legislation of their own, or until the

new IMO requirements for ship design characteristics start to bite. Either way, before 2000 the two-tier market is not likely to be exclusive to the US trades; by then it will incorporate other major markets. None of this, of course, guarantees future profits for the shipowner; ships will be better designed, better built, better run, but still subject to the forces of supply and demand.

So far, OPA has not had a dramatic effect on tanker rates. Modern tonnage traditionally obtains a premium, of sharply varying size, in the term market, and OPA has sharpened the distinction, but the market has only briefly acknowledged the further distinction of a double hull. There were periods in 1991 when new, double-hulled Suezmax tankers did command a premium in the timecharter market of around $5000/day (about 20% at that time.) That was sufficient to justify the incremental costs of the investment in a double-hulled ship, though nowhere near enough to justify the investment itself.

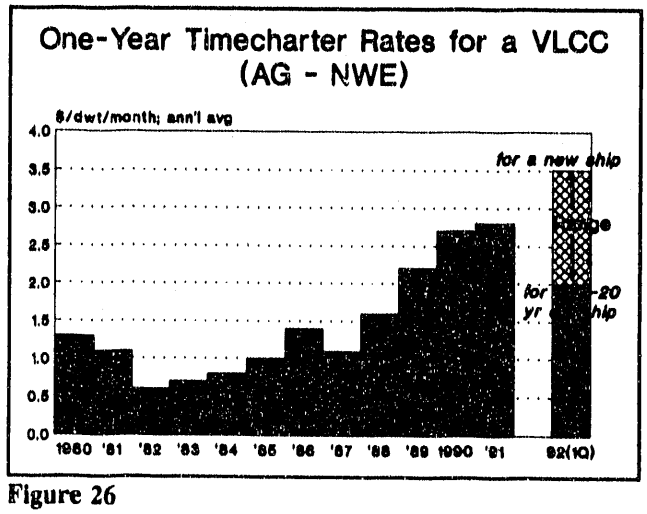


Figure 26

That premium disappeared by the end of the year. More fundamental factors were at work: the rising tonnage surplus was forcing rates down sharply. Last year saw the strongest timecharter market in 17 years, and rates firmed as the year progressed. During the same period, spot rates halved, to a ten year low and to rates less than 20% of those needed to provide a positive cash flow on a new ship.

Spot rates have continued to fall this year, and timecharter rates have started to follow. (According to Clarkson's Research Studies, the average earnings of a new VLCC were $35,700/day in 1991. In the first quarter of 1992 the average was $16,500/day). But while the spot market, with VLCC rates below $10,000/day, shows little inclination to differentiate between ships -- it rarely has -- the term market continues to offer premiums for modern (but not double-hulled) tonnage. Few term fixtures are being made at present, but for the modern VLCC one-year timecharters are in the $28-32,000/day range, and for a 1970's-built VLCC, in the $15-18,000/day range. This is approximately 30% below the average 1991 levels.

VLCC Imports from Arabian Gulf, 1Q 1992
($/Bbl)

	Buyer's Cost*	Shipowner's Cost**
1970's-built VLCC	0.40-0.65	0.40-0.65
1989 VLCC	0.40-1.28	1.20-1.30
Newbuilding Double-hulled VLCC	0.40-1.28	2.00-2.20

* depends on type of charter and condition of ship.
** depends on ship condition, management/operational efficiency, financing terms.

Additional evidence of OPA's impact is seen in contracts for long term charters for double-hulled tankers currently on order, which are typically at a premium over current, or even last year's timecharter levels. The first instance of such an arrangement was when BP committed, two years ago, to charter five new VLCC's for five years at $35,000/day, with options for a further three, then two, years, at rates of $40,000/day and $42,000/day respectively. These rates would be sufficient to provide a modest return on investment at the newbuilding prices prevailing at the time the orders were placed.

Though subsequent similar deals are relatively few, they point the way to the future. The combination of a desire on the part of charterers to ensure access to quality tonnage (and to avoid a potentially unstable market in the late 1990's) and the need of owners to demonstrate to their banks adequate cash flow in the early years of their new vessel's lives, points to a resurgence of long-term chartering -- at higher rates -- eventually.

The prospect of significantly higher tanker rates arising from fundamental market forces puts OPA-induced costs in perspective. For example, a new, double-hulled VLCC carrying oil from the Middle East to the U.S., will require freight rates to be the equivalent of approximately 80¢/bbl above last year's timecharter levels. Of this, OPA-induced costs amount to around 35¢/bbl.

How soon the higher rates arrive depends overwhelmingly on scrapping rates during the 1990's (ignoring the ever present threat of major political disruptions.) In the meantime, the only consolation to owners of new double-hulled tonnage is that while the required premiums are not available in the freight markets, their chances of obtaining charters are well above average.

3. Trading Patterns Barely Change

Distribution patterns, once imported oil reaches the EEZ, should not change significantly: the majority of tankers will continue to call at U.S. mainland ports. As U.S. crude oil imports rise, LOOP will be operating at or very close to its practical capacity of 1.2 thousand B/D. There are no plans to build other offshore oil ports. A feasibility study undertaken last year by a consortium of oil industry interests decided against such a facility off the Texas coast. The substantial cost advantage of lightering, combined with

its excellent safety record, makes the investment difficult to justify. Increasingly, after 1995, U.S. oil imports must therefore be brought directly into port, lightered or transshipped, or put into storage in the Caribbean. Accessible storage capacity is limited. Venezuela owns substantial terminal capacity, and Saudi Arabia also has a long term interest in the region.

Growth, then, will be in port calls and/or lightering. The majority opinion seems to be that lightering growth will be modest, but it could be substantial. As more crude comes to the U.S. from the Middle East a greater proportion of imports will be carried in VLCC's and ULCC's. These tend to lighter 60 miles offshore and do not approach the U.S. coast.

Although this market is seen primarily as one for single-hulled tankers as they age, there have already been enquiries in the market for double-hulled tankers for long term timecharters specifically for lightering. The most plausible reason for this apparent "operational overkill" is that it is a demonstration of commitment to running a first class operation.

Lightering closer to shore involves Aframax and Suezmax tankers, which offload up to half their cargo prior to calling at a U.S. port. While these ship sizes will remain popular due to their trading flexibility, the trades in which these vessels are employed may see only moderate growth, particularly in the latter half of the 1990's.

As with other activities, lightering involves trade-offs. Offshore lightering requires a ULCC to remain in "OPA territory" for 7-8 days, albeit in an area where the risk of incurring crippling damage claims is low. Coastal lightering requires perhaps one day of lightering and two days in port -- but the whole time is spent in a much higher risk area. Sometimes the choice will depend on operator preference, but most of the time the trade route and shipping economics will dictate the lightering pattern.

In all this there is nothing to suggest that the principal effect of the growth in U.S. imports will be other than rising port calls, OPA notwithstanding: at least until there is another catastrophic spill in U.S. waters.

APPENDIX I

OPA MANDATORY RETIREMENTS FOR EXISTING VESSELS

Date double hulls are required	Tank Vessel Tonnage/Type of Construction/Date of Delivery					
	5,000 - 14,999 gross tons		15,000 - 29,999 gross tons		30,000 gross tons or more	
	Single skin	Double bottoms or sides	Single skin	Double bottoms or sides	Single skin	Double bottoms or sides
January 1, 1995	Prior to January 1, 1955	Prior to January 1, 1950	Prior to January 1, 1955	Prior to January 1, 1950	Prior to January 1, 1967	Prior to January 1, 1962
Anniversary Date in 1995*	Vessels Delivered in 1955	Vessels Delivered in 1950	Vessels Delivered in 1955	Vessels Delivered in 1950	Vessels Delivered in 1967	Vessels Delivered in 1962
January 1, 1996	January 1, 1956 - December 31, 1956	January 1, 1951 - December 31, 1951	January 1, 1956 - December 31, 1957	January 1, 1951 - December 31, 1952	January 1, 1968 - December 31, 1968	January 1, 1963 - December 31, 1963
Anniversary Date in 1996	Vessels Delivered in 1957	Vessels Delivered in 1952	Vessels Delivered in 1958	Vessels Delivered in 1953	Vessels Delivered in 1969	Vessels Delivered in 1964
January 1, 1997	January 1, 1958 - December 31, 1958	January 1, 1953 - December 31, 1953	January 1, 1959 - December 31, 1960	January 1, 1954 - December 31, 1955	January 1, 1970 - December 31, 1970	January 1, 1965 - December 31, 1965
Anniversary Date in 1997	Vessels Delivered in 1959	Vessels Delivered in 1954	Vessels Delivered in 1961	Vessels Delivered in 1956	Vessels Delivered in 1971	Vessels Delivered in 1966
January 1, 1998	January 1, 1960 - December 31, 1960	January 1, 1955 - December 31, 1955	January 1, 1962 - December 31, 1963	January 1, 1957 - December 31, 1958	January 1, 1972 - December 31, 1972	January 1, 1967 - December 31, 1967
Anniversary Date in 1998	Vessels Delivered in 1961	Vessels Delivered in 1956	Vessels Delivered in 1964	Vessels Delivered in 1959	Vessels Delivered in 1973	Vessels Delivered in 1968
January 1, 1999	January 1, 1962 - December 31, 1962	January 1, 1957 - December 31, 1957	January 1, 1965 - December 31, 1966	January 1, 1960 - December 31, 1961	January 1, 1974 - December 31, 1974	January 1, 1968 - December 31, 1968
Anniversary Date in 1999	Vessels Delivered in 1963	Vessels Delivered in 1968	Vessels Delivered in 1967	Vessels Delivered in 1962	Vessels Delivered in 1975	Vessels Delivered in 1970
January 1, 2000	January 1, 1964 - December 31, 1964	January 1, 1959 - December 31, 1959	January 1, 1968 - December 31, 1969	January 1, 1963 - December 31, 1964	January 1, 1976 - December 31, 1976	January 1, 1971 - December 31, 1971
Anniversary Date in 2000	Vessels Delivered in 1965	Vessels Delivered in 1960	Vessels Delivered in 1970	Vessels Delivered in 1965	Vessels Delivered in 1977	Vessels Delivered in 1972

January 1, 2001	-	-	January 1, 1971 - December 31, 1971	January 1, 1966 - December 31, 1966	-	-
Anniversary Date in 2001	Vessels Delivered in 1966	Vessels Delivered in 1961	Vessels Delivered in 1972	Vessels Delivered in 1967	Vessels Delivered in 1978	Vessels Delivered in 1973
January 1, 2002	-	-	January 1, 1973 - December 31, 1973	January 1, 1968 - December 31, 1968	-	-
Anniversary Date in 2002	Vessels Delivered in 1967	Vessels Delivered in 1962	Vessels Delivered in 1974	Vessels Delivered in 1969	Vessels Delivered in 1979	Vessels Delivered in 1974
January 1, 2003	-	-	January 1, 1975 - December 31, 1975	January 1, 1970 - December 31, 1970	-	-
Anniversary Date in 2003	Vessels Delivered in 1968	Vessels Delivered in 1963	Vessels Delivered in 1976	Vessels Delivered in 1971	Vessels Delivered in 1980	Vessels Delivered in 1975
January 1, 2004	-	-	January 1, 1977 - December 31, 1977	January 1, 1972 - December 31, 1972	-	-
Anniversary Date in 2004	Vessels Delivered in 1969	Vessels Delivered in 1964	Vessels Delivered in 1978	Vessels Delivered in 1973	Vessels Delivered in 1981	Vessels Delivered in 1976
January 1, 2005	January 1, 1970 - December 31, 1979	January 1, 1965 - December 31, 1974	January 1, 1979 - December 31, 1979	January 1, 1974 - December 31, 1974		
Anniversary Date in 2005	Vessels Delivered in 1980	Vessels Delivered in 1975	Vessels Delivered in 1980	Vessels Delivered in 1975	Vessels Delivered in 1982	Vessels Delivered in 1977
Anniversary Date in 2006	Vessels Delivered in 1981	Vessels Delivered in 1976	Vessels Delivered in 1981	Vessels Delivered in 1976	Vessels Delivered in 1983	Vessels Delivered in 1978
Anniversary Date in 2007	Vessels Delivered in 1982	Vessels Delivered in 1977	Vessels Delivered in 1982	Vessels Delivered in 1977	Vessels Delivered in 1984	Vessels Delivered in 1979
Anniversary Date in 2008	Vessels Delivered in 1983	Vessels Delivered in 1978	Vessles Delivered in 1983	Vessels Delivered in 1978	Vessels Delivered in 1985	Vessels Delivered in 1980
Anniversary Date in 2009	Vessels Delivered in 1984	Vessels Delivered in 1979	Vessels Delivered in 1984	Vessels Delivered in 1979	Vessels Delivered in 1986	Vessels Delivered in 1981

January 1, 2010	All Vessels Delivered after December 31, 1984	-	All Vessels Delivered after December 31, 1984	-	All Vessels Delivered after December 31, 1986	-
Anniversary Date in 2010	–	Vessels Delivered in 1980	–	Vessels Delivered in 1980	–	Vessels Delivered in 1982
Anniversary Date in 2011	-	Vessels Delivered in 1981	-	Vessels Delivered in 1981	-	Vessels Delivered in 1983
Anniversary Date in 2012	-	Vessels Delivered in 1982	-	Vessels Delivered in 1982	-	Vessels Delivered in 1984
Anniversary Date in 2013	-	Vessels Delivered in 1983	-	Vessels Delivered in 1983	-	Vessels Delivered in 1985
Anniversary Date in 2014	-	Vessels Delivered in 1984	-	Vessels Delivered in 1984	-	Vessels Delivered in 1986
January 1, 2015	-	All Vessels Delivered after December 31, 1984	-	All Vessels Delivered after December 31, 1984	-	All Vessels Delivered after December 31, 1986

* Anniversary Date refers to the date of delivery of the vessel.

APPENDIX II

SECTION 1. Synopsis of Coastal State Statutes

SECTION 2. State Financial Responsibility & Contingency Plan Status

SECTION 3. Details of State Statutes

SECTION 1

Synopsis of Coastal State Statutes

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Alabama	Any person whose wrongful act, omission or negligence caused a discharge of oil.	Negligence. Damages include clean-up and abatement, damages to natural resources. If conduct causing the spill was willful or grossly negligent punitive damages may be recovered.	None set out in statute.	Includes but not limited to dredged spoil, solid waste, incinerator residue, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat. Unclear, but probably includes oil.	None. If mere negligence, no punitive damages may be imposed.	None. Criminal: No less than $2,000 and no more than $25,000 per day or 1 year prison. Fines for making false statement on filed report or tampering with equipment.
Alaska	(1) the owner, and the person having control over, the hazardous substance at the time of the release or threatened release; (2) the owner and the operator of a vessel ["operator" means the person who, through contract, lease, sublease, or otherwise, exerts general supervision and control of activities at the facility; the term includes, by way of example and not limitation, a prime or general contractor, the master of a vessel and the master's employer, or any other person who, personally or through an agent or contractor, undertakes the general functioning of the facility], or facility, from which there is a release, or a threatened release that causes response costs to be incurred, of a hazardous substance;	Strict liability. Damages to public and private persons or property including damage to natural resources.	If damages occur solely as a result of: (A) act of war; (B) intentional or negligent act of a third party, other than agents in privity of contract if the responsible person shows that it (i) exercised due care and (ii) took reasonable precautions against the act or omission of the third party; (C) act of God if responsible person discovered release and began cleanup within a reasonable time.	Expressly includes oil.	None.	Against cargo owner and shipowner and operator penalties not to exceed (a) $10 per gallon discharged into fresh water, with significant aquatic resources; (b) $2.50 per gallon discharged into intertidal waters, and (c) $1 per gallon discharged into salt water with no significant aquatic resources. Grossly negligent or intentional discharge increases penalties by a factor of five. Liability for full amount if discharge exceeds 18,000 gallons up to maximum penalty of $500 million. A discharge of crude oil in excess of 18,000 gallons subjects a violator to a maximum penalty of $500 million, in the amount of $8 and $12.50 per gallon. Any violation of the statute carries a penalty of not less than $500 and no more than $100,000.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Alaska	(3) any person who at the time of disposal of any hazardous substance owned or operated any facility or vessel at which the hazardous substances were disposed of, from which there is a release, or a threatened release that causes the incurrence of response costs, of a hazardous substance; (4) any person who by contract, agreement, or otherwise arranged for disposal or treatment, or arranged with a transporter for transport for disposal or treatment, of hazardous substances owned or possessed by the person, other than domestic sewage, or by any other party or entity, at any facility or vessel owned or operated by another party or entity and containing hazardous substances, from which there is a release, or a threatened release that causes the incurrence of response costs, of a hazardous substance; (5) any person who accepts or accepted any hazardous substances, other than refined oil, for transport to disposal or treatment facilities, vessels or sites selected by the person, from which there is disposal or treatment facilities,					Liability for full amount of damage for discharge of residuary product of petroleum or ballast water from cargo tank. Criminal: A criminally negligent discharge is a felony if 10,000 barrels or more of oil are released. The reckless operation of tank vessel and creation of unjustifiable risk of discharge of hazardous substance are misdemeanors. Failure to provide information and making false representations to the Department are misdemeanors.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Alaska	vessels or sites selected by the person, from which there is a release, or a threatened release that causes the incurrence of response costs, of a hazardous substance.					
California	The owner or transporter of oil or a person accepting responsibility for the oil; owner, operator, lessee or charterer by demise of the vessel or person or entity accepting responsibility for the vessel. [Any person who owns, has ownership interest in, operates, charters by demise or leases the vessel, except holders of indicia of ownership primarily to protect a security interest who do not participate in management].	Strict liability for cleanup costs, restoration of natural resources, damages to third parties including economic loss. Damages to the state for monies expended due to discharge.	If caused solely by act of War, act of God which could not have been avoided with due diligence, negligence of injured party, criminal act of unrelated third party; or by permit of government.	Oil of any kind.	None.	Negligent or intentional failure to follow an order or prevent a discharge penalized by imprisonment and no less than $5,000 and no more than $500,000 per violation per day. Any person discharging oil is liable for an amount not to exceed $10 per gallon discharged or $30 per gallon if discharge was grossly negligent or reckless. Criminal: From $5,000 up to $500,000 per violation per day or imprisonment. Operating without contingency plan or failing to notify authorities carries penalty of not less than $2,500 and not more than $250,000 and/or one year prison.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Connecticut	Any person, firm or corporation which directly or indirectly causes . . . an emergency through the discharge, spillage, uncontrolled loss, or seepage of oil or petroleum.	Strict liability for all costs and expenses of containment, removal, and mitigation of pollution.	None.	Includes oil and petroleum.	None.	For negligence, up to 1 1/2 times cost of cleanup. For willful discharge or gross negligence, up to 2 times the clean-up costs. Criminal: Violators of statute fined up to $10,000 per day. Willful or criminally negligent violators fined up to $25,000 per day or 1 year prison. Second offenders fined up to $50,000 or 2 years prison.
Delaware	Owner [any person holding title to, or, in the absence of title, any other indicia of ownership of a vessel or facility, but not a person having only a security interest in, or security title to, a vessel or facility, under a contract of conditional sale, an equipment trust, a chattel or corporate mortgage, a lease which is the functional equivalent of an extension of credit or any similar instrument], operator, charterer by demise, any person responsible for operation, manning, victualing or supplying of the vessel.	Strict liability for cleanup costs, injury to or loss of use of natural resources, damages to third parties including economic loss.	If caused by act of war, civil war, insurrection or natural phenomenon, or willful misconduct of claimant.	Petroleum, crude or any fraction or residue therefrom.	Greater of $350,000 or $300 per gross ton up to $30 million. No limit if misconduct was willful or spill was caused by negligence.	Violation of Ch. 60 carries penalty of up to $10,000 per day of violation. Possible administrative penalty of up to $10,000 per day of violation. Failure to notify authorities carries fine between $1,000 and $10,000. Violation of Ch. 62 carries penalty between $1,000 and $10,000 for each day of violation. Criminal: Knowing failure to report discharge, between $2,500 and $25,000 per day or up to 6 months prison. Willful or negligent discharge without a permit penalized from $2,500 to $25,000 per day. Violations of Ch. 60 shall be fined between $500 and $5,000 and/or 6 months prison and $5,000 and/or 6 months or prison.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Florida	Vessel owners and operators, vessel's agents or servants who permit or suffer a prohibited discharge. NOTE: Cargo owner is liable up to limits if vessel never satisfied Florida's financial responsibility requirements or if the cargo owner had 72 hours certified notice that vessel's evidence of financial responsibility had been withdrawn or cancelled.	Strict liability for costs of cleanup and abatement, damages to natural resources, and damages to property of third parties.	Solely the result of an act of war, state, federal or municipal government, unforeseeable act of God or act or omission of a third party.	Includes oil of any kind and in any form, and gasoline.	For cleanup and abatement: Vessel of 3,000 or more gross tons, the greater of $1,200 per gross ton or $10 million. Vessel of less than 3,000 gross tons, the greater of $1200 per gross ton or $2 million. If willful or gross negligence or willful misconduct within privity and knowledge of owner or operator, no limit. For other damages no limit.	Up to $50,000 per day of violation. Additional $500 upon persons responsible for 2 or more discharges within the state in 12 month period. $25,000 for failure to have financial responsibility. $5,000 against Master for failure to have contingency plan. Criminal: Failure to report spill; insufficient financial security and fleeing are third degree felonies.
Georgia	Person who causes or permits discharge of oil into waters.	Negligence for discharge of oil, industrial waste, scum or floating debris.	General negligence defenses.	Oil.	None.	Up to $50,000 per day. Subsequent offense within 12 months fined by up to $100,000 per day. For knowing violation of Ch. 14 up to $1,000 per day of violation.
	Owner of oil or person having control over it who fails to report discharge to Georgia Dept. of Natural Resources Emergency Operations Center.	Strict liability for discharge of toxic, corrosive, acidic or bacterial substance.	None.	Gasoline, crude, fuel oil, diesel oil, lubricating oil, oil refuse, any other petroleum related product.	None, but liability is only incurred for failure to report, and it is characterized as a penalty.	Criminal: Fine between $2,500 per day and $25,000 per day and/or 2 years prison. Subsequent violation fined up to $50,000 and/or 2 years prison. Knowingly making false statement on report or tampering with monitoring equipment penalized by up to $10,000 and/or 2 years prison.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Hawaii	Any person who by contract, agreement, or otherwise arranged for disposal or treatment, or arranged with a transporter for transport for disposal or treatment of hazardous substances or pollutants or contaminants owned or possessed by such person, by any other party or entity, at any facility or on any vessel owned or operated by another party or entity and containing such hazardous substance or pollutants or contaminants.	Strict liability for costs of removal, remedial action, and response costs incurred by the State or any person, damages to natural resources.	Act of God, war or unrelated third party.	Includes oil.	None.	Up to 3 times liability. $25,000 per day of violation in cases of willful violations. Criminal: $10,000 and up to 3 years prison for failure to notify of release.
Illinois	Any person who causes or threatens or allows discharge of contaminant so as to cause water pollution in the state.	Strict liability for clean-up costs and damages to property, and for value of natural resources destroyed.	Permit issued by federal agency. Proof that compliance with Board's regulations imposes arbitrary or unreasonable hardship.	Any solid, liquid, gaseous matter, odor or energy. Any hazardous substance as defined by federal statutory standards. Excludes petroleum, crude oil or any fraction thereof not otherwise listed as designated hazardous substance. Excludes natural gas, natural gas liquids, liquified natural gas and synthetic gas.	None.	Up to $10,000 and additional $1,000 per day of violation. Penalties for violation of filing requirement, regulation or order not to exceed $25,000. Criminal: Any violation of the Act or regulation and any false representation are misdemeanors. Knowingly disposing of hazardous waste with conscious disregard creating danger of serious bodily harm or danger to public health constitutes the offense of Calculated Criminal Disposal of Hazardous Waste.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Indiana	Any person who discharges, emits, causes, allows or threatens to discharge any contaminant or waste.	Civil and criminal penalties.	None specified in statute.	Contaminant or waste, including noxious odor. Any solid, semi-solid, liquid or gaseous matter, or any order, radioactive material pollutant (federal standard) or hazardous waste (federal standard).	No.	Up to $25,000 per day of violation. Up to $500 per hour of violation if violation of an order of the Department. Criminal: Negligent, reckless or knowing violation up to $25,000 per day, and up to $50,000 per day for second offense. Knowing misrepresentation or tampering with monitoring device, up to $10,000 per day.
Louisiana	Any person who discharged or allowed discharge.	Strict liability for cleanup costs and damages to natural resources.	Act of God, war, terrorism, government, or willful or negligent act of unrelated third parties.	Any substance of any kind that will tend to cause water pollution; includes oil.	For vessels of more than 3,000 gross tons, $1200 per gross ton up to $10 million. For vessels o 3000 gross tons or less, $1200 per gross ton up to $2 million. No limitation if spill caused by gross negligence or willful misconduct or if responsible party fails to report the spill.	$25,000 per day of violation. For discharges that cause irreparable or severe damage or endangers human life, a penalty up to $1,000,000. Criminal: $1 million plus $100,000 per violation and/or 10 years prison at hard labor. Willful or knowing discharge which does not endanger human life is penalized up to $2,500 per day and/or 1 year prison.
Maine	Any person, vessel, licensee, agent or servant. . . who permits or suffers a prohibited discharge or polluting condition.	Strict liability to fund all costs of removal and abatement, funds for research and development, and damages to third parties including loss of income.	Act of war, God or government.	Oil.	None.	Up to 2 times the damages for failure to reimburse State fund within 60 days of demand.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Maryland	1) Owner of the discharged oil; 2) The owner, operator or person in charge of the oil storage facility, vessel, barge, or vehicle involved in the discharge at the time of or immediately before the discharge; and 3) Any other person who through act or omission causes the discharge.	Strict liability for cleanup and response costs, restoration of affected area.	Emergency imperiling life or property, unavoidable accident, collision or stranding, or state permit.	Oil of any kind.	None.	$25,000 per day of violation plus additional penalty of up to $10,000 a day up to $100,000. Where more than 25,000 gallons discharged, up to $100 per gallon discharged. Criminal: Up to $50,000 and/or 1 year prison. For second offenses, up to $50,000 per day and/or 2 years prison. For knowingly making false statement or tampering with monitoring device, up to $10,000 and/or six months prison.
Massachusetts	Owner, operator [any person owning, operating or chartering by demise such vessel . . . but not a person who, without participating in management of a vessel . . . holds indicia of ownership primarily to protect a security interest in said vessel], or any person who otherwise caused or is legally responsible for a release or threat.	Strict liability for cleanup, damages to natural resources, and to third parties for injury to real and personal property.	Act of God, war, or third party not in a contractual relationship.	Oil of any kind.	None. Person liable may show by preponderance of evidence responsibility for only portion of liability and pay for that portion only.	Treble damages against person liable where Dept. incurs costs of assessment, containment and removal. Up to $25,000 per day of violation. Criminal: Fine of $25,000 and/or two years prison. Up to $100,000 and/or twenty years prison per violation for failure to notify authorities of spill.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Michigan	Any person who places, throws, deposits, discharges or causes to be discharged into waters of the state, any substance which renders water unsightly, noxious or otherwise unwholesome or detrimental to public health or enjoyment. Owner or operator of a watercraft who directly or indirectly discharges oil into or onto waters of the state, shorelines or beaches.	Strict liability for costs incurred by state for removal of oil.	None.	Litter, sewage, oil or other liquids or solid materials which pollutes the water or is a detriment to public health.	None.	Criminal: Violations are misdemeanors punishable by up to $500 and/or prison of up to 92 days.
Minnesota	Any person who discharges pollutant.	Discretionary damages for accidental or non-accidental discharge, including all costs to recover discharged substance and abate pollution.	Proof that violation was caused solely by (1) act of God, (2) act of war, (3) negligence of the state, or (4) act or failure to act that constitutes sabotage or vandalism.	Any sewage; any liquid, solid or solid waste resulting from industry, manufacture or development of natural resource; or any other waste which may pollute or tend to pollute the waters of the state.	None.	Any violation, up to $10,000 per day. Except if it relates to hazardous waste, the person forfeits and pays up to $25,000 per day of violation to the state. Criminal: Where state proves willful discharge, may recover the reasonable value of its litigation expenses.
Mississippi	Any person who causes pollution of any waters in State.	Strict liability (public nuisance) for cleanup and restocking wildlife, and litigation costs.	None.	Anything which would tend to cause pollution of the waters.	None.	Up to $25,000 per day per violation. Criminal: Between $12,500 and $25,000 per day of violation.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
New Hampshire	Operator [person owning or operating any oil terminal or vessel, whether by lease, contract, or any other form of agreement] or other person who directly or indirectly causes or suffers a discharge of oil into or onto any surface or groundwater of the state.	Strict liability for cleanup and restoration of natural resources. Negligence for damages to third parties. Double damages awarded for damages to property of third parties.	None, but operator can seek indemnity from the party who was responsible.	Oil of any kind.	None.	Up to $10,000 per day of violation. For violation of Ch. 146A, up to $2,000. Criminal: Natural persons' willful discharge of oil that seeps into public waters is misdemeanor. For non-natural persons it is a felony.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
New Jersey	Any person who has discharged a hazardous substance or is in any way responsible for any hazardous substance which the department has removed or is removing.	Strict liability for cleanup and removal costs.	Act of war, sabotage or God.	Oil or petroleum of any kind.	$150 per gross ton. Not available for gross negligence, willful misconduct, gross or willful violation of safety regulation.	$50,000 per day. Up to $10 million for discharge of 100,000 gallons or more. Criminal: Up to $250,000 per day and/or imprisonment for purposely, knowing or reckless violation causing significant environmental effect. Up to $50,000 per day and/or imprisonment for negligent violation, falsification of document, or tampering with monitoring device. Up to $100,000 per day for second offenses. Up to $75,000 per day and/or prison for knowing or recklessly making false representation. For purposely or knowingly violating a permit or discharging without a permit and knowing it risks death or serious bodily injury, a fine between $50,000 and $250,000 or, for corporations, between $200,000 and $1 million and/or prison.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
New York	Any person who has discharged petroleum, including oil, fuel oil and other oil products.	Strict liability for cleanup, restoration of natural resources, damages to property of third parties.	Act of war, sabotage, or government negligence.	Petroleum, oil, including fuel oil and other types of oil products.	$300 per gross ton, unless willful misconduct or gross negligence, or gross or willful violation of applicable regulation or standard.	Up to $25,000 per day of violation. $50,000 for violation of booming requirements where transfer was of 1 million gallons or more. Criminal: Intentional, knowing, reckless or criminally negligent violations are misdemeanors penalized by $2,500 to $25,000 per day and/or 1 year prison. For second offense, up to $50,000 per day and/or 2 year prison.
North Carolina	a) The owner or transporter of natural gas, oil, or drilling waste which causes an injury covered by this Part. b) The owner, operator, lessee of or person who charters by demise, any . . . vessel . . . which is the source of natural gas, oil, drilling waste, or is the source or location of exploration which causes an injury covered by this Part. 'Responsible party' does not include the United States, the State, any county, municipality or public governmental agency; however, this exception to the definition of 'responsible person' shall not be read to exempt utilities. from the provisions of this Part.	Strict liability for cleanup, restoration of natural resources including loss of income due to destruction of natural resources, and third party damages including loss of income.	Act of God, war, criminal act of unrelated third party, negligence of injured party.	Oil of any kind.	None.	Up to $250,000 per day for failure to notify of discharge of over. 50,000 gallons. For intentional or negligent discharge, up to $5,000 per violation. Criminal: Fine of up to $100,000 per day not to exceed $500,000 and 3 year prison for willfully or knowingly discharging. Fine of up to $250,000 per day not to exceed $1 Million and 10 years imprisonment for discharge with knowledge that it poses threat of serious bodily injury.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Ohio	Any person who causes pollution or places or causes to be placed any sewage, industrial waste or other waste where they pollute the waters of the state.	Public nuisance. All common law and equity actions are still available.	None.	Includes any sewage; any liquid, gaseous or solid waste substance resulting from industry, manufacture, business or natural resource development; any other wastes, and any other pollutants or toxic pollutants as defined by federal law.	None.	Up to $25,000 and/or up to one year prison for any violation. Up to $25,000 for knowingly submitting false information. Attorney general can bring actions for any violation. Criminal: Up to $25,000 and/or up to one year prison for discharging oil without a permit.
Oregon	Any person owning or having control over any oil which enters the waters of the state. "Person having control over oil" includes but is not limited to any person using, storing or transporting oil immediately prior to entry of such oil into the waters of the state and shall specifically include carriers and bailees of such oil.	Strict liability for cleanup and abatement, all damages to persons or property, public or private caused by the spill.	Act of war, sabotage, God, government, third party.	Oil.	None.	Up to 3 times cleanup costs for anyone who does not make a good faith effort to clean up oil when obligated to do so. Note: Owners of cargo are obligated to do so. Willful or negligent discharge penalized by amount commensurate with damages caused.
Pennsylvania	Any person who puts, places or permits discharge of any substance of any kind or character resulting in pollution.	Cause of action based on nuisance.	Common law defenses to nuisance action.	Any substance resulting in pollution.	None.	Up to $10,000 per day of violation. Criminal: A violation carries penalty of at least $100 up to $10,000, and 90 days imprisonment upon non-payment. Willful or negligent violation at least $2,500 up to $25,000 and/or one year prison. Subsequent violation within 2 years doubles the initial maximum penalty.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Puerto Rico	Persons who directly or indirectly throw, discharge, pour or dump, or permit to be thrown, discharged, poured or dumped oil or other pollutants	Choice of action by the government of Puerto Rico. No new rights to property owners.	None set out in statute.	Oil.	None.	Criminal: Up to $1,000 per day of violation or up to 1 year imprisonment.
Rhode Island	Any person who discharges, causes to be discharged or permits the discharge of oil into or upon the waters of the state. Includes owner and operator of a vessel as well as their agents. "Operator" means the person who, through contract, lease, sub-lease or otherwise exerts general supervision and control of activities including but not limited to a prime or general contractor, the master of a vessel and the master's employer, or any other person who, personally or through an agent or contractor, undertakes the general functioning of the facility.	Strict liability for investigation, detection and cleanup; restoration of natural resources.	State permit, act of God, act of a third party, a negligent or intentional act of the United States, or an act of war.	Petroleum and petroleum products, including oil.	None.	Up to $25,000 per day. Administrative penalties up to $25,000 per day. For failure to prove financial responsibility, the greater of $100,000 or 2 times cost of curing the environment. Criminal: Up to $25,000 and/or 5 years prison. Fines and prison for knowingly falsifying or tampering with monitoring devices.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
South Carolina	Any person discharging pollutants.	Strict liability for cleanup and abatement and proven damages to natural resources. Claims for damages to third parties are subject to arbitration.	Act of God, war, U.S. or political subdivision, or third party or state permit.	Oil of any kind.	None.	Up to $10,000 per day for each violation. Violation of Ch. 43, penalized by up to $5,000 per day. Criminal: Up to $1,000 and/or 6 months prison. False statements and tampering with monitoring equipment subject to penalties. Violation of Ch. 1 carries fine not less than $500 and not more than $2,500 per day and/or 2 year prison.
Texas	Owner, operator, or demise charterer of a vessel from which a spill emanates; or any other person who causes, suffers, allows or permits a spill or discharge.	Strict liability for cleanup and abatement, restoration of natural resources, and damages to third parties, including economic loss.	Act of God, war, third party negligence or government.	Includes oil.	Response costs: For vessels of 300 gross tons or less that do not carry oil as a cargo, limited to $1 million. Vessels of 8,000 gross tons or less, limited to $5 million. Vessels of more than 8000 gross tons, limited to $600 per gross ton up to a maximum of $50 million. Damages other than natural resource damages: vessels of 300 gross tons or less, limited to $1 million. Vessels of 8,000 gross tons or less, limited to $5 million. Vessels of more than 8,000 gross tons limited to $600 per gross ton up to a maximum of $50 million. Natural resource damages: unlimited liability. No limitation for gross negligence or willful misconduct.	or failure to notify, between $500 and up to $250,000 for natural person and $500,000 for corporation. Fine of not less than $250 and not more than $25,000 per day, not to exceed $1,000 per barrel. Up to $25,000 per day or treble response costs. Criminal: Operating vessel or facility without contingency plan or evidence of financial responsibility, failing to report discharge, taking vessel out of state are misdemeanors.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
U.S. Virgin Islands	Persons causing the discharge; any licensee and its agents or servants, including vessels destined for or leaving a licensee's terminal facility, who permits or suffers a prohibited discharge.	Strict for cleanup, abatement, rehabilitation or wildlife.	Act of war, unforeseeable act of God, act of government, act or omission of third party.	Oil of any kind, in any form.	None.	Up to $50,000 per day. Criminal: Up to $10,000 for failure to notify of spill.
Virginia	Any person discharging or causing or permitting a discharge of oil into or upon state waters . . . or . . . which may reasonably be expected to enter state waters ... and any operator ["operator" means any person who owns, operates, charters, rents or otherwise exercises control over or responsibility for a . . . vessel] of any . . . vessel from which there is a discharge of oil into or upon state waters	Strict liability (Commonwealth not required to plead or prove negligence) for cleanup costs, loss non-restorable natural resources, property damage, and damages to third parties including loss of income.	Act of God, war or third party.	Oil.	Greater of $500 per gross ton or $10 million. No limitation on liability if spill caused by gross negligence or willful misconduct, or if responsible party violated safety, construction or operation regulations. No limitation if responsible party failed to report discharge or cooperate in clean-up and containment.	Up to $100 per gallon discharged. Up to $100,000 for failure to maintain evidence of financial responsibility. Up to $50,000 for failing to obtain approval for contingency plan, plus $5,000 per day of violation. Up to $50,000 plus $10,000 per day for failure to cooperate in containment and clean-up. Criminal: Up to $100,000 and/or imprisonment for 1 year. Negligent discharge, $50,000 and/or 1 year imprisonment. Knowing and willful discharge, up to $100,000 and/or up to 10 years imprisonment. Subsequent violation, up to $100,000 and/or up to 10 years imprisonment.

STATE	POTENTIALLY RESPONSIBLE PARTY	BASIS FOR LIABILITY AND DAMAGES	DEFENSES	POLLUTANT	LIMITATION ON LIABILITY	CIVIL PENALTIES
Washington	Any person owning oil or having control over oil that enters the waters of the state. "Having control over oil" shall include but not be limited to any person using, storing, or transporting oil immediately prior to entry of such oil into the waters of the state, and shall specifically include carriers and bailees of such oil.	Strict liability for clean-up and removal costs, and all environmental damages.	State permit, act of war, sabotage or government.	Oil.	None.	Up to $20,000 per day of violation against any person who negligently discharges oil plus up to $10,000 per day for unauthorized discharges. If intent is shown; $100,000. Failure to have contingency plan and evidence of financial responsibility, up to $100,000 on tank vessel that transfers oil to facility. Criminal: Willful violation, up to $10,000 and/or 1 year prison. Operating vessel without contingency plan or evidence of financial responsibility is misdemeanor. Subsequent conviction and reckless operation of a vessel are felonies.

SECTION 2

State Financial Responsibility & Contingency Plan Status

State	Financial Responsibility	Vessel Contingency Plan	Direct Action
Alaska	Operators of tankers are required to provide evidence of financial responsibility. Crude: Greater of $300 per barrel of storage capacity or $1 billion. Non-crude: Greater of $100 per incident per barrel of storage capacity or $100 million.	Yes-enforced. A person may not operate a tank vessel or barge without an approved contingency plan. Plan must be submitted to the State for renewal every 3 years.	Yes. An action for discharge of oil, release of hazardous substances, or lack of prevention and contingency plans may be brought directly against insurer, group or person providing evidence of financial responsibility.
California	Vessel operators must obtain a certificate that demonstrates financial ability to pay (P&I cover is acceptable) an amount of $500 million on January 1, 1992, $750 million on July 1, 1995, and $1 billion on January 1, 2000.	Yes. Plans must include standard for response, containment and clean-up; training; and evidence of adequate finances and resources.	No.

State	Financial Responsibility	Vessel Contingency Plan	Direct Action
Delaware	The vessel owner or operator must obtain evidence of financial responsibility of the greater of $300 per gross ton or $250,000, up to $30 million, for vessels over 300 gross tons. Evidence of insurance, guarantee, surety bond or qualification as self-insurer is acceptable. Not being enforced or planned to be enforced.	No.	No.
Florida	The vessel owner or operator must submit evidence of financial responsibility for vessels of 3,000 gross tons or more, the greater of $1,200 per gross ton or $10 million. For vessels of less than 3,000 gross tons, the greater of $1,200 per gross ton or $2 million. Evidence of enrollment in a P&I Club is an acceptable form of financial responsibility.	Required for all vessels with storage capacity of 10,000 gallons or more of oil or gasoline as cargo or fuel. Plans which comply with Federal requirement are acceptable. Plans must cover response, notification, mitigation and containment.	No.
Louisiana	Yes, pursuant to Federal requirements.	Vessel owner or operator must have tank vessel and facility response plans.	No.

State	Financial Responsibility	Vessel Contingency Plan	Direct Action
Maine	No.	Department of Environmental Protection has authority to issue rules requiring Plans.	No.
Maryland	A vessel must have a bond or other security of $500 per gross ton for vessels carrying over 25 barrels of oil. This may be obtained by the vessel owner, agent or charterer. Requirement not being enforced. Regulations are presently being promulgated which would allow federal certificates to satisfy requirement.	Department of the Environment has authority to establish contingency plan regulations for barges and vessels, but none exist.	No.
Massachusetts	No.	Department of Environmental Quality Engineering has authority to prepare a State Contingency Plan applicable to vessels carrying hazardous materials (not oil).	No.

State	Financial Responsibility	Vessel Contingency Plan	Direct Action
New Hampshire	Bond required from oil, gas and petroleum supplies, dealers and others against emergency clean-up costs and environmental damage. The State is developing a bonding schedule.	Regulations pending. Remedial action plan required from responsible parties after a spill to protect human health and environment.	No.
New Jersey	Owner or operator of major facility or transmission pipeline must maintain evidence of financial responsibility pursuant to amounts, terms and conditions determined by the Department. Federal certificate of financial responsibility are accepted.	No.	Yes. Claims for costs, penalties or damages by the State, and claims for damages by an injured person, may be brought directly against bond, insurer or other person providing evidence of financial responsibility.

State	Financial Responsibility	Vessel Contingency Plan	Direct Action
New York	Department of Environmental Conservation Regulation requires owner or operator to provide evidence of financial responsibility of $300 per gross ton as insurance, self-insurance or surety bond.	Habitat Protection Plan required.	Yes. Claims for costs, penalties or damages by the State, and claims for damages by an injured person, may be brought directly against bond, insurer or other person providing evidence of financial responsibility.
North Carolina	No requirement but if sufficient surety or cash deposit is made, State will not have a lien upon vessel.	No.	No.
Ohio	No.	With the issuance of permits, Vessel may be required to submit plans, specifications and other information.	No.

State	Financial Responsibility	Vessel Contingency Plan	Direct Action
Oregon	Vessels over 300 gross tons transporting oil in bulk as cargo must show financial responsibility in the greater of $1,200 per gross ton or $2 Million for vessels of 3,000 gross tons or less; and $1,200 per gross tons or $10 Million for vessels over 3,000 gross tons. For other vessels over 300 gross tons, responsibility for the greater of $600 per gross ton or $500,000. No regulations establishing a method of application for approval or enforcement have been promulgated.	Yes.	No.
Rhode Island	Owners and operators of vessels of 1,000 gross tons or more, capable of loading 12 foot draft are obliged to show evidence of $1,200 per gross ton of weight of vessel and its cargo.	No.	No.
South Carolina	Owners or operators of terminal facilities must furnish evidence of financial responsibility of $14 Million. Requirement satisfied by insurance or surety bond by authorized company, qualifications of self-insurance, or other acceptable evidence.	No.	No.

State	Financial Responsibility	Vessel Contingency Plan	Direct Action
Texas	Each owner or operator shall maintain evidence of financial responsibility for costs and damages.	Any vessel with the capacity to carry 10,000 gallons or more of oil shall maintain discharge prevention and response plans. Federally accepted contingency plans will satisfy this requirement.	Yes. The state may bring suit directly against any bond, insurer, guarantor or person providing evidence of financial responsibility to liable party.
U.S. Virgin Islands	Requires owners and operators to establish evidence of financial responsibility. No regulations have been promulgated.	To be established by regulation; no regulations have been promulgated.	Yes. Claims for costs, penalties or damages by the Territory, and claims for damages by injured person may be brought directly against bond, insurer or other person providing evidence of financial responsibility.

State	Financial Responsibility	Vessel Contingency Plan	Direct Action
Virginia	Operators of oil tank vessels will be required to show financial responsibility of $500 per gross ton of vessel. Operators of tank vessels will be exempt from requirement by showing evidence of financial responsibility equal to the cash deposit, as self-insurance, insurance, guarantee or surety. Operator and insurer must appoint agent of process, insurer must be authorized to do business in the Commonwealth. Requirement does not cover facility or tank vessel with maximum capacity of less than 15,000 gallons of oil. Regulations were promulgated on December 9, 1991.	Yes.	Yes. If financial responsibility is evidenced by insurance, instrument must provide for direct action against insurer or guarantor. This does not apply where P&I coverage is used for evidence of financial responsibility because it is considered self-insurance.

State	Financial Responsibility	Vessel Contingency Plan	Direct Action
Washington	Oil tankers and cargo carrying oil or hazardous substances in bulk must establish financial responsibility in the greater of $1 million or $150 per gross ton. Tank vessel carrying out in bulk must evidence responsibility of at least $500 Million. Barges of 300 gross tons or less are subject to lesser standards. Cargo or passenger vessels carrying oil as fuel must evidence responsibility of $600 per gross ton or $500,000. No requirement for owners or operators of tank vessels that are members of P&I mutual organizations with coverage for oil pollution risks up to statutory amounts. Regulations being promulgated should allow financial responsibility to be evidenced by a Federal certificate.	All tank vessels and barges carrying oil in bulk, cargo and passenger vessels 300 gross tons or greater, and oil processing and storage facilities which receive oil from tankers must have contingency plans. Plans must provide for spill prevention, containment and clean-up. Federally accepted contingency plans will satisfy requirements.	No.

SECTION 3

Details of State Statutes

ALABAMA

Law(s)	*Title.* Alabama Water Pollution Control Act
	Cite. Code of Alabama, Vol 14, Ch. 22, §22-22 et seq.. Health, Mental Health, Environmental control, §22-22-9.
	Year Enacted. 1971
	Recent Amendments. 1990 and 1991.

Liability

Vessel Owner or Operator	Yes ("any person who has discharged oil").
Other Responsible Parties	None.
Basis for Liability	Negligence.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* Reasonable costs incurred to prevent, minimize or clean up any damage resulting from an oil spill that occurs due to the "wrongful act, omission or negligence" of a person.
	Natural Resources. Liability for amount of money necessary to restock the waters and replenish the wildlife pursuant to death caused by a violation of the statute.
	Property. May include compensatory if violation was willful or wanton.
	Other. May include punitive damages if violation was willful or wanton.
Penalties	*Civil.* None.
	Criminal. Willful or grossly negligent violations shall be fined by no less than $2,000 nor more than $25,000 per day or imprisonment for not more than one year, or both. Fines imposed for making a false statement on a record or report filed or for falsifying or tampering with monitoring equipment.

Prevention and Control

Financial Responsibility	None.
Spill Contingency Plan	None.
Manning and Equipment	None, except that the Commissioner of the State Environmental Agency may require a person discharging pollutants in State waters to maintain records; make reports; and install and use monitoring equipment.
Notification	None.
Inspection	Employees of the State Department of Environment may enter any property to obtain information concerning discharge.

ALASKA

Law(s)	*Title.* Water, Air Energy and Environmental Conservation
	Cite. Alaska Statutes. Title 46, §46.03.010 *et seq.* and 18 AAC 75.080 *et seq.*
	Year Enacted. 1971.
	Recent Amendments. 1989, 1990 and 1991.

Liability

Vessel Owner or Operator	Yes ("any person responsible" for a vessel from which oil is released).
Other Responsible Parties	Cargo owner.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All reasonable measures to contain and cleanup by a person with control over a hazardous substance that enters the waters of the State.
	Natural Resources. Liability to the State for the cost of restoration of wildlife and the environment after a discharge caused death to fish, animal or vegetation.
	Property. Strict liability for damages to private or public property caused by the hazardous substance.
	Other. Department of Environmental Conservation must seek reimbursement to the State in civil action for full amount of actual damages caused to the State.
Penalties	*Civil.* Penalty for discharge not to exceed (i) $10 per gallon discharged into fresh water with "significant aquatic resources"; (ii) $2.50 per gallon discharged into intertidal water, and (iii) $1 per gallon discharged into salt water without "significant aquatic resources." Grossly negligent or intentional discharge may increase penalties by a factor of five. Liability for the full amount of the penalties if discharge exceeds 18,000 gallons. Penalties for violations of Chapter 3 of Title 46 of not less than $500 nor more than $100,000. Liability to the State for full amount of actual damage for discharge of residuary product of petroleum or ballast water from cargo tank. A discharge in excess of 18,000 gallons may subject a person to maximum penalty of $500 million. A vessel may be detained without a warrant as security for payment.
	Criminal. Violation of a provision of the law or order of the Department of Environmental Conservation, failure to provide or falsify information to the Department, or false representation to the Department are misdemeanors. A criminally negligent discharge is a felony if 10,000

ALASKA

barrels or more of oil are released. The reckless operation of a tank vessel and creation of an unjustifiable risk of releasing a hazardous substance are misdemeanors.

Prevention and Control

Financial Responsibility	Vessels carrying crude oil must evidence financial responsibility in the greater of $300 per incident for each barrel of storage capacity or $100 million, and vessels carrying non-crude oil must evidence financial responsibility in the greater of $100 per incident for each barrel of storage capacity or $1 million. It may be in any form that the Department of Environmental Conservation approves.
Spill Contingency Plan	No person may operate a tank vessel or oil barge unless the oil spill contingency plan has been approved by the State.
Manning and Equipment	Insure availability of sufficient personnel, oil discharge prevention equipment, and storage transfer and cleanup equipment.
Notification	Yes, immediately.
Inspection	Yes.

CALIFORNIA

Law(s)	*Title and Cite.* Title 2 of the Government Code of the State of California, Ch 7 the California Emergency Service Act §8550 et seq; Ch 7.4 Oil Spill Response and Contingency Planning, §8574.1 et seq.; Division 7.8 of the Public Resources Code, § 8750 et seq, and the Water Code §13272.
	Year Enacted. 1968 (Harbors and Navigation Code) and 1972 (Water Code).
	Amendments. 1990.

Liability

Vessel Owner or Operator	Yes ("any person responsible for the discharge of oil").
Other Responsible Parties	Cargo owner and charterer.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* Costs of response, containment, cleanup, removal and treatment.
	Natural Resources. Injury to or destruction of natural resources including costs of restoration of any natural resource.
	Property. Injury to, or economic loss resulting from destruction or injury to real or personal property; loss of profits or impairment of earning capacity, and loss of taxes, rents and royalties.
	Other. A responsible party is liable to the State Oil Spill Prevention and Administration Fund for monies expended to pay costs associated with any damage to the State or other injured parties.
Penalties	*Civil.* Any intentional or negligent failure to follow an order, notify the Coast Guard, prevent the discharge of oil or cleanup is subject to imprisonment and a fine of no less $5,000 nor more than $500,000 per violation per day. Any person who discharges oil is strictly liable for a penalty not to exceed $10 per gallon discharged or $30 per gallon if the discharge was grossly negligent or reckless.
	Criminal. Any person who knowingly fails to follow an administrative order, fails to notify the Coast Guard of a discharge, discharges oil, or fails to clean up is subject to imprisonment and a fine of not less than $5,000 nor more than $500,000 per violation per day.

CALIFORNIA

Any person who fails to notify the Office of Emergency Services or operates without a contingency plan is subject to a fine of not less than $2,500 nor more that $250,000 or imprisonment for not more than one year, or both.

Prevention and Control

Financial Responsibility	Must obtain a certificate that demonstrates a financial ability to pay (P&I cover).
Spill Contingency Plan	Yes. Plan should include standards for response, containment and cleanup; training of personnel, and evidence of adequate finance and resources for equipment.
Manning and Equipment	All necessary equipment to respond, contain and cleanup worst scenario spill. At least one person fluent in English and the language of the master must be on the bridge at all times. Tugboat escort requirements.
Notification	Yes, written notice within 48 hours.
Inspection	Employees of the State Department of Environment may enter any property to obtain information concerning discharge.

CONNECTICUT

Law(s)	*Title.* Connecticut's Water Pollution Control Law.
	Cite. Conn. Gen. Stat. §22a-448 et seq.
	Year Enacted. 1985.
	Recent Amendments. 1990.
	Liability
Vessel Owner or Operator	Yes ("any person who discharges oil").
Other Responsible Parties	None.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All costs and expenses of containing, removing or mitigating the discharge.
Penalties	*Civil.* In cases of negligent discharge, the court may impose liability for damages equal to one and a half times the costs and expenses incurred. In cases of willful discharge, court may impose liability equal to two times such costs and expenses. Person required to report the discharge may be fined for failure to do so. *Criminal.* Violators may face a fine of up to $10,000 per day. Willful or criminally negligent violations punishable by up to $25,000 per day and one year imprisonment. Second offenses are punishable by fines of up to $50,000 and two years imprisonment. Persons who knowingly make false statements or tamper with monitoring devices may also be fined.
	Prevention and Control
Financial Responsibility	None.
Spill Contingency Plan	None.
Manning and Equipment	Transfers of oil must be boomed.
Notification	State shall promulgate rules to require notification of a spill by the master of a vessel which discharges oil to the police.
Inspection	Commissioner of Environmental Protection has right to inspect equipment used for transfer of oil.

DELAWARE

Law(s)

Title. Division of Environmental Control and Oil Pollution Liability.

Cite. Delaware Code, Title 7, Chapters 60 & 62, §6001 and 6201 et seq.

Year Enacted. 1953 (Chapter 60) and 1961 (Chapter 62).

Recent Amendments. 1990 and 1991.

Liability

Vessel Owner or Operator

Yes ("a demise charterer or any other person who is responsible for the operation, manning, victualing or supplying of a vessel" or "any person holding title to, or indicia of ownership of a vessel").

Other Responsible Parties

Charterer.

Basis for Liability

Strict.

Limitation on Liability

Yes. Limited to the greater of $300 per gross ton or $350,000, up to $30,000,000. No limit it there is negligence or willful misconduct.

Damages

Cleanup Expenses. All necessary costs.

Natural Resources. Damages due to injury to, destruction, or loss of use of natural resources.

Property. Damages due to injury to, destruction, or loss of use of real or personal property; loss of profits or impairment of earning capacity, and loss of tax revenue for a period of one year due to injury to real or personal property.

Penalties

Civil. Any violation carries penalty of up to $10,000 for each day of violation, plus an additional administrative penalty of up to $10,000 per day. Failure to notify the Department by any person causing or contributing to the discharge carries a penalty of between $1,000 and $10,000. Other violations carry penalties of between $1,000 and $10,000.

Criminal. For willful or negligent discharge of pollutants without a permit, a fine of from $2,500 to $25,000 for each day of such violation. For knowingly making a false statement on an application or report required to be filed, a fine of between $500 and $5,000 or by imprisonment of not more than six months, or both. For knowingly failing to report a discharge, a fine of between $2,500 and $25,000 and up to six months imprisonment.

Prevention and Control

Financial Responsibility

Financial responsibility certificate required for any limitation of liability. Mandatory for the owner or operator of a vessel over 300 gross tons. Amount required is the greater of $300 per gross ton or $250,000, but not exceeding $30,000,000. Evidence of insurance, guarantee, surety bond or qualification as a self insurer are acceptable forms of evidence.

DELAWARE

Spill Contingency Plan	Not required.
Manning and Equipment	None.
Notification	None.
Inspection	Secretary of the Department may enter any property in regulation of water pollution.

FLORIDA

Law(s)	*Title.* Pollutant, Discharge and Prevention and Removal Law. *Cite.* Florida Statutes, Title 28, §376.12(1) et seq. *Year Enacted.* 1983. *Recent Amendments.* 1990 and 1991.
	Liability
Vessel Owner or Operator	Yes ("any vessel transporting pollutants as cargo, or its agents or servants, who permits or suffers a prohibited discharge").
Other Responsible Parties	Contingent liability for cargo owners.
Basis for Liability	Strict.
Limitation on Liability	Liability of owner or operator for costs of cleanup and abatement is limited for a vessel of over 3,000 gross tons or more to the greater of $1,200 per gross ton or $10 million, and for vessel of less than 3,000 gross tons to the greater of $1,200 per gross ton or $2,000,000. The cap may increase to $100,000,000 if the State permits oil drilling off the coast. No limit on liability for other damages imposed upon owner and operator. No limitation if discharge was caused by willful or gross negligence or willful misconduct within the privity or knowledge of the owner, operator or agent of the vessel, if there was a failure to report the incident by a responsible party who knew or had reason to knew thereof, or if responsible party refused to provide cooperation and assistance during clean-up activities.
Damages	*Cleanup Expenses.* All clean-up and abatement costs. *Natural Resources.* Liability for any cost of damages for the injury or destruction of natural resources, including costs of resource restoration, water restocking and third party damages. *Property.* None.
Penalties	*Civil.* A fine of $25,000 for the failure to maintain financial responsibility. A fine of $50,000 per day of violation may be imposed for violation of the Statute. A court may impose a penalty of $500 upon persons responsible for two or more discharges in the waters of the state within a twelve month period. A fine of $5,000 against the Master for failure to have a contingency plan.

FLORIDA

Criminal. Failure to report a spill, insufficient financial security and "fleeing the waters" are third degree felonies.

Prevention and Control

Financial Responsibility	Evidence of financial responsibility for a vessel of 3,000 gross tons or more, must be the greater of $1,200 per gross ton or $10,000,000, and for vessel of less than 3,000 gross tons, the greater of $1,200 per gross ton or $2,000,000.
Spill Contingency Plan	All vessels with a capacity of 10,000 gallons or more of oil or gasoline as cargo or fuel is required to maintain a contingency plan and a plan for response, notification, mitigation and containment.
Manning and Equipment	Department of Natural Resources has statutory authority to promulgate regulations requiring vessels to maintain prevention in excess of Federal requirements.
Notification	None.
Inspection	Yes. Pilot or master of a vessel must within one hour of discovery of a spill notify the Florida Marine Patrol or the USCG.

GEORGIA

Law(s)	*Title.* Water Quality Control Act. *Cite.* Georgia Code, Volume 10, Title 12, Chapter 5, Art. §12-5-51 and Chapter 14 §12-12-1 et seq. *Year Enacted.* 1971 (Chapter 5) and 1988 (Chapter 14). *Recent Amendments.* 1991 (Chapter 14).
	Liability
Vessel Owner or Operator	Yes ("any person who intentionally or negligently or accidently causes. . . ").
Other Responsible Parties	None.
Basis for Liability	Negligence for discharge of oil, industrial waste, scum or floating debris. Strict for discharge of a toxic, corrosive, acidic or bacterial substance.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* Cleanup and abatement costs reasonably incurred by the State due to the spill. *Natural Resources.* Costs reasonably incurred in replacing aquatic life destroyed by the spill. *Property.* Damages recoverable by civil action.
Penalties	*Civil.* Any violation of Article 2 or a failure to comply with an order of the Director may be penalized up to $50,000 per day of violation. A subsequent offense within twelve months of the initial offense may be fined an amount not in excess of $100,000 per day. Any knowing violation of Chapter 14 may be penalized in an amount not to exceed $1,000 per day. *Criminal.* Any violation of a court order may be fined not less than $2,500 per day and no more than $25,000 per day or by imprisonment of no more than one year, or both. A subsequent violation may be fined by no more than $50,000 or imprisonment for no more than two years, or both. Knowingly making a false statement or representation on any application or report, and tampering with monitoring equipment are felonies, punishable by no more than $10,000 or imprisonment for no more than two years, or both. Subsequent conviction for same offense may be double the penalty. A person who knowingly violates the applicable law or fails to follow a court order and who knows such conduct causes imminent danger of death or serious bodily injury to another is guilty of a felony.
	Prevention and Control
Financial Responsibility	None.
Spill Contingency Plan	None.

GEORGIA

Manning and Equipment	None.
Notification	Yes, immediately to USCG and to Environmental Protection Division of Natural Resources.
Inspection	Yes.

HAWAII

Law(s)	*Title.* Environmental Emergency Response Act; Water Pollution Act.
	Cite. HAW. STAT. §128D-1 et seq., and §342D-1 et seq.
	Year Enacted. 1988 (§138D-1) and 1989 (§342D-1).
	Recent Amendments. 1990 and 1991.

Liability

Vessel Owner or Operator	Yes ("any person who has accepted the pollutant for transport").
Other Responsible Parties	Cargo owner and charterer.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All costs of removal and remedial action, necessary response costs, and the costs of any health effects studies.
	Natural Resources. All injuries to natural resources and costs of assessing such injuries.
	Property. None.
Penalties	*Civil.* Punitive damages of up to three times the costs incurred against any responsible person who fails to take ordered remedial action. Penalty of up to $25,000 per day of violation in cases of willful violation any provision of the applicable law.
	Criminal. Failure to notify the Department of Health immediately upon knowledge of the release of a hazardous substance carries a fine of up to $10,000 per day of violation and up to three years imprisonment.

Prevention and Control

Financial Responsibility	None.
Spill Contingency Plan	None.
Manning and Equipment	None.
Notification	Yes. Person in charge of the vessel must immediately notify the Department of Health.
Inspection	Yes. Right to inspect suspected sources of pollution.

INDIANA

Law(s)	*Title.* Indiana's Environmental Management Act. *Cite.* IND. CODE. §13-7-1-1 et seq. *Year Enacted.* 1985. *Recent Amendments.* 1989 and 1991.
	Liability
Vessel Owner or Operator	Yes ("any person who discharges a contaminant").
Other Responsible Parties	None.
Basis for Liability	Civil and criminal penalties.
Limitation on Liability	Not applicable.
Damages	*Cleanup Expenses.* None. *Natural Resources.* None. *Property.* None.
Penalties	*Civil.* A violation of the Act renders the violator liable for a penalty of up to $25,000 per day of violation. A violation of an order of the Department renders the violator liable for a penalty of up to $500 per hour of violation. *Criminal.* A person who negligently, recklessly, knowingly or intentionally violates the Act or any regulation will be fined up to $25,000 per day of violation, or up to $50,000 per day of violations for a second offense. A person who knowingly misrepresents or falsifies or tampers with monitoring devices will be fined up to $10,000 per day.
	Prevention and Control
Financial Responsibility	None.
Spill Contingency Plan	None.
Manning and Equipment	None.
Notification	None.
Inspection	The Department may survey and inspect sources of environmental pollution.

ILLINOIS

Law(s)	*Title.* Illinois Environmental Protection Act.
	Cite. Illinois Revised Statutes, Chapters 111-1/2. §1001 et seq.; and Illinois Regulations Concerning Oil Pollution, 35 Adm. Code, part 308.
	Year Enacted. 1970.
	Recent Amendments. 1991.
	Liability
Vessel Owner or Operator	None specified.
Other Responsible Parties	"Any person who causes or threatens to allow the discharge of any contaminants into the environment in any State so as to cause or tend to cause water pollution in the State is liable."
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All actions already available for costs or damages remain available.
	Natural Resources. Liability for the reasonable value of any fish or aquatic life whose death was caused by the spill.
	Property. Same as Cleanup Expenses.
Penalties	*Civil.* In case of an emergency, the Illinois EPA may seal any equipment or vessel which is violating the law. Fines for violations may not exceed $10,000 and civil penalties may not exceed $1,000 for each day of violation. Violation of a filing requirement or an order may be penalized by a fine of up to $25,000.
	Criminal. Any violation of the Act or of the regulations done pursuant to the Act, and the submission of false information under the Act constitutes a misdemeanor.
	Prevention and Control
Financial Responsibility	None.
Spill Contingency Plan	None.
Manning and Equipment	None.
Notification	None.
Inspection	None.

LOUISIANA

Law(s)

Title. Louisiana Oil Spill Prevention and Response Act ("OSPRA"); Louisiana Environmental Quality Act, and Louisiana Water Control Law.

Cite. Louisiana Revised Statutes Annotated, Chapter 19, title 30, 30:2451 et seq.; Chapters 2, §201 et seq., and Chapter 3, §207 et seq.

Year Enacted. 1950.

Recent Amendments. 1989 and 1991.

Liability

Vessel Owner or Operator	Yes ("any person who violates these Acts").
Other Responsible Parties	None.
Basis for Liability	Strict.
Limitation on Liability	Yes. OSPRA limits liability for vessel owner or operator of a tank vessel to $1,200 per gross ton up to $10,000,000 for vessels greater than 3,000 gross tons, or up to $2,000,000 for vessels of 3,000 gross tons or less. No limitation available if spill is caused primarily by gross negligence or willful misconduct, or caused by the violation of an applicable regulation, or if responsible party fails to report the incident he knew or had reason to know of or failed to provide all reasonable cooperation when requested.
Damages	*Cleanup Expenses.* The State may recover any damages resulting from the violation of these Acts or their regulations. *Natural Resources.* Same as above. Concerning natural resource, the amount of damages established by Oil Spill Coordinator shall create a rebuttable presumption of the amount of such damage. *Property.* Same as above.
Penalties	*Civil.* Penalty for a basic violation is of $25,000 per day of violation. For discharges that cause "irreparable or severe" damage or if the substance endangers human life there is an additional penalty of up to $1,000,000. *Criminal.* Willful or knowing discharge which endangers human life or health is a felony, penalized by up to $1,000,000 or cost of cleanup and a fine or up to $100,000 per day of violation and costs of prosecution, imprisonment at hard labor for up to 10 years, or both. Willful or knowing discharge which does not endanger human life or health is a misdemeanor, penalized by a fine of up to $25,000 per day of violation and costs of prosecution, imprisonment for up to 1 year, or both. False statement or knowingly rendering inaccurate any monitoring device shall be penalized by a fine not greater than $25,000, imprisonment of six months, or both.

LOUISIANA

Prevention and Control

Financial Responsibility	Yes.
Spill Contingency Plan	The vessel owner or operator must provide the Coordinator the required tank vessel and facility response plans. Upon entry the person in charge may be required to render a report concerning such things as unauthorized discharges from the vessel since last leaving the port, any mechanical or operational problem, any denial of entry into any port, evidence of financial responsibility, etc.
Manning and Equipment	The Coordinator may hire a person or entity for the use of equipment and personnel at places deemed to be necessary for response in prevention operation. A person may not leave or maintain any structure involved in an actual or threatened unauthorized discharge.
Notification	Discharger must immediately notify the Office of Water Resources. Failure to do constitutes a separate offense subject to a civil fine of $25,000 per day of violation. The Coordinator must be notified within 24 hours of the discharge.
Inspection	Limited to matters reasonably believed to have led to the circumstances.

MAINE

Law(s)	*Title.* Maine Oil Pollution Statute.
	Cite. Maine Revised Statutes Annotated, Title 38, Waters and Navigation, Chapter 3, Subchapter II-A, Oil Discharge Prevention and Pollution Control, §541 et seq.
	Year Enacted.
	Recent Amendments. 1989 and 1990.

Liability

Vessel Owner or Operator	Yes.
Other Responsible Parties	"Licensee shall be liable for all acts and omissions of its servants and agents, and carriers destined for the licensee's facilities from the time such carrier shall enter state waters until such time as the carrier shall leave state waters."
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* Any person discharging or suffering the discharge is responsible for immediate removal. All of the state costs of cleanup and removal and services of contractors will come from the state oil pollution fund, to which the owner or operator of a vessel must reimburse.
	Natural Resources. Sums allocated to research and development
	Property. The owner or operator is liable to the state for damages to real or personal property or loss of income directly attributed to the discharge.
Penalties	*Civil.* A penalty not greater than twice the amount of liability to the state will be imposed if liability is not paid within 60 days of demand. No fines shall be imposed on a person responsible for a discharge if he reports the spill within two hours of its occurrence, promptly removes the spill and reimburses the oil spill fund for any disbursements.
	Criminal. None specified.

Prevention and Control

Financial Responsibility	None specified.
Spill Contingency Plan	In addition to the Federal spill contingency plan requirements, the Department of Environmental Protection is authorized to issue rules requiring plans.
Manning and Equipment	None, except for vessels engaged in lightering.
Notification	Yes, within two hours.

MAINE

Inspection	None, except for vessels engaged in lightering. Department of Environmental Protection may inspect any vessel docked in the State.

MARYLAND

Law(s)	*Title.* Maryland's Water Pollution Control and Abatement Act. *Cite.* MD.ENVT.CODE §4-401 et seq. (the Act) and MD.REGS.CODE, Title 26, §.01 et seq. *Year Enacted.* 1957 and 1990 (Reenacted). *Recent Amendments.* 1991.
	Liability
Vessel Owner or Operator	Yes ("person responsible for a discharge", "person in charge of a vessel or barge" and "any person who caused a discharge through his act or omission").
Other Responsible Parties	Cargo owner.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All necessary costs. *Natural Resources.* All costs of restoring any damaged area to its natural condition. *Property.* None specified. *Other.* Fees for labor and equipment used in responding to the spill.
Penalties	*Civil.* Any violation carries penalty of up to $25,000 for day of violation, plus an additional penalty of up to $10,000 per day not to exceed $100,000. Any person responsible for discharge of over 25,000 gallons of oil may be fined up to $100 per gallon discharged. *Criminal.* Knowingly making a false statement or tampering with a monitoring device may be fined up to $10,000 or imprisoned for up to six months, or both. Any violation of the Act is a misdemeanor, subjecting the violator to a fine of up to $50,000 and imprisonment of up to one year, or both. Second offenses subject the offender to a fine of up to $50,000 per day of violation or imprisonment of up to two years, or both.
	Prevention and Control
Financial Responsibility	A bond or other security for $500 per gross ton for vessels carrying more than 25 barrels of oil within state waters.
Spill Contingency Plan	Department of the Environment may promulgate regulations requiring plans.
Manning and Equipment	None, except the Department of the Environment has authority to regulate

MAINE

Inspection	None, except for vessels engaged in lightering. Department of Environmental Protection may inspect any vessel docked in the State.

MARYLAND

Law(s)	*Title.* Maryland's Water Pollution Control and Abatement Act.
	Cite. MD.ENVT.CODE §4-401 et seq. (the Act) and MD.REGS.CODE, Title 26, §.01 et seq.
	Year Enacted. 1957 and 1990 (Reenacted).
	Recent Amendments. 1991.
	Liability
Vessel Owner or Operator	Yes ("person responsible for a discharge", "person in charge of a vessel or barge" and "any person who caused a discharge through his act or omission").
Other Responsible Parties	Cargo owner.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All necessary costs.
	Natural Resources. All costs of restoring any damaged area to its natural condition.
	Property. None specified.
	Other. Fees for labor and equipment used in responding to the spill.
Penalties	*Civil.* Any violation carries penalty of up to $25,000 for day of violation, plus an additional penalty of up to $10,000 per day not to exceed $100,000.
	Any person responsible for discharge of over 25,000 gallons of oil may be fined up to $100 per gallon discharged.
	Criminal. Knowingly making a false statement or tampering with a monitoring device may be fined up to $10,000 or imprisoned for up to six months, or both. Any violation of the Act is a misdemeanor, subjecting the violator to a fine of up to $50,000 and imprisonment of up to one year, or both. Second offenses subject the offender to a fine of up to $50,000 per day of violation or imprisonment of up to two years, or both.
	Prevention and Control
Financial Responsibility	A bond or other security for $500 per gross ton for vessels carrying more than 25 barrels of oil within state waters.
Spill Contingency Plan	Department of the Environment may promulgate regulations requiring plans.
Manning and Equipment	None, except the Department of the Environment has authority to regulate

MARYLAND

	vessels carrying oil in state waters.
Notification	Requirement for immediate notification on any person discharging or permitting the discharge or who participates in such discharge. Requirement of submission of written report within 10 working days after cleanup by responsible person to Maryland's Hazardous and Solid Waste Management Administration.
Inspection	Department of the Environment may enter vessels and barges.

MASSACHUSETTS

Law(s)	*Title.* Oil and Hazardous Materials Prevention Act.
	Cite. Massachusetts General Laws, Chapter 21E, §1 et seq.
	Year Enacted. 1983.
	Recent Amendments. 1987.
	Liability
Vessel Owner or Operator	Yes ("any person who caused or is legally responsible for a release or threatened release of oil or hazardous material from a vessel or site").
Other Responsible Parties	None.
Basis for Liability	Strict.
Limitation on Liability	None. A person liable who establishes by preponderance of the evidence that only a portion of such liability is attributable to a discharge for which he is considered a responsible party, may pay only such portion.
Damages	*Cleanup Expenses.* All costs of assessment, containment and removal.
	Natural Resources. All damages for injury to and for destruction, or loss of use of natural resources.
	Property. To third parties for damages to his real or personal property caused by the release or threat of release.
	Other. Treble damages against person liable for release or threat of release where the department incurs costs for assessment, containment and removal.
Penalties	*Civil.* Up to $25,000 per day of violation.
	Criminal. Up to $25,000, imprisonment up to two years, or both, for each violation. For untimely notification of release, a fine or up to $100,000, or imprisonment up to 30 years in a state prison, or up to two and one half years in a hail or house of correction, or both, for each violation.
	Prevention and Control
Financial Responsibility	None specified.
Spill Contingency Plan	The Department of Environmental Quality Engineering may prepare a State Contingency Plan and require such plans of vessels carrying hazardous materials (not oil).
Manning and Equipment	The Department is authorized to require such containment and removal action as it may deem necessary.

MASSACHUSETTS

Notification	Owner or operator of a vessel having knowledge of the spill must immediately notify.
Inspection	All authorized personnel has a right to reasonable access of any site or vessel.

MICHIGAN

Law(s)	*Title.* Watercraft Pollution Control Act.
	Cite. Michigan Statutes Annotated, Misc. Boards and Commissions §3.533(201) et seq.
	Year Enacted. 1971.
	Recent Amendments. 1990.
	Liability
Vessel Owner or Operator	Yes ("a person shall not discharge or permit the discharge of oil from a watercraft or a docking facility").
Other Responsible Parties	None.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All expenses reasonably incurred by the State.
	Natural Resources. None specified.
	Property. None specified.
Penalties	*Civil.* None specified.
	Criminal. A violation of the Act constitutes a misdemeanor, punishable by imprisonment of not more than 92 days, or a fine of not more than $500, or both.
	Prevention and Control
Financial Responsibility	None specified.
Spill Contingency Plan	None specified.
Manning and Equipment	None specified, except concerning a sanitation device.
Notification	None.
Inspection	All vessels in State waters are subject to inspection.

MINNESOTA

Law(s)	*Title.* Water Pollution Control Act.
	Cite. MINN.STAT., § 115.01 et seq.
	Year Enacted. 1945.
	Recent Amendments. 1991.
	Liability
Vessel Owner or Operator	Yes ("any person who discharged pollutant").
Other Responsible Parties	None.
Basis for Liability	None specified, but the court has discretion to force a party responsible for an accidental or non-accidental discharge to pay damages.
Limitation on Liability	None specified.
Damages	*Cleanup Expenses.* All costs. All measures to recover the discharge substance and minimize or abate pollution.
	Natural Resources. Compensation for the destruction of wildlife.
	Property. None specified.
Penalties	*Civil.* Any violation carries penalty of up to $10,000 per day of violation.
	Criminal. A willful or negligent violation is a misdemeanor. Where the State proves that in an action brought by it the discharge was willful, it may recover the reasonable value of its litigation expenses.
	Prevention and Control
Financial Responsibility	None specified.
Spill Contingency Plan	None specified.
Manning and Equipment	None specified.
Notification	"Any person" must notify the Pollution Control Agency or a discharge.
Inspection	Control Agency may board any vessel to obtain information, examine records or conduct investigations with respect to pollution.

MISSISSIPPI

Law(s)	*Title.* Air and Water Pollution Control Law.
	Cite. Mississippi Code, Title 49, Chapter 17, §49-17-1 et seq.
	Year Enacted. 1966.
	Recent Amendments. 1988 and 1991.
	Liability
Vessel Owner or Operator	Yes ("any person").
Other Responsible Parties	None.
Basis for Liability	Public nuisance.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All costs.
	Natural Resources. Sum "reasonably necessary to restock such waters or replenish such wildlife as determined by the Commission."
	Property. None specified.
	Other. Litigation costs.
Penalties	*Civil.* Up to $25,000 per day.
	Criminal. Fine of between $12,500 to $25,000 per day of violation.
	Prevention and Control
Financial Responsibility	None specified.
Spill Contingency Plan	None specified.
Manning and Equipment	None specified.
Notification	None specified.
Inspection	None specified.

NEW HAMPSHIRE

Law(s)	*Title.* Oil Spillage in Public Waters.
	Cite. New Hampshire Revised Statute Annotated, Vol. 2-A, Chapter 146A; and New Hampshire Code of Administrative Rules, Part Env. -Ws 412.
	Year Enacted. 1971.
	Recent Amendments. 1990.
	Liability
Vessel Owner or Operator	Yes ("person that causes directly or indirectly the discharge of oil into State waters").
Other Responsible Parties	None.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* State costs for containment, cleanup and removal of spill.
	Natural Resources. Costs to restore the damaged surrounding environment.
	Property. Double the damage sustained to real or personal property of third parties.
Penalties	*Civil.* Penalty not more than $10,000 for discharge of oil. Penalty not more than $2,000 for violation of Chapter 146A.
	Criminal. A natural person who willfully discharges oil that seeps into public waters commits a misdemeanor and any other person commits a felony.
	Prevention and Control
Financial Responsibility	Bond required from all oil, gas and petroleum suppliers, dealers and others against all emergency cleanup costs and environmental damages.
Spill Contingency Plan	Regulations pending. A Remedial Action Plan must be submitted by responsible parties after a spill has occurred for protection of human health and the environment.
Manning and Equipment	None specified.
Notification	Yes, immediately.
Inspection	None specified.

NEW JERSEY

Law(s)	*Title.* New Jersey's Waters and Water Supply Code. *Cite.* N.J.STAT. §58:10-23.11g et seq.; and N.J.REG. §7:1E.1-1 et seq. *Year Enacted.* 1976. *Recent Amendments.* 1990.
	Liability
Vessel Owner or Operator	Yes (any person who "is in any way responsible for the hazardous substance").
Other Responsible Parties	Cargo owners.
Basis for Liablity	Joint, several and strict.
Limitation on Liability	Yes. Liability of an owner or operator is limited to $150 per gross ton, except where the discharge was due to gross negligence or willful misconduct within the knowledge of the owner, operator or person in charge, or due to a gross or willful violation of a safety construction or operating standard or regulation.
Damages	*Cleanup Expenses.* All cleanup and removal costs. *Natural Resources.* Cost of restoration or replacement of any natural resource damaged or destroyed. *Property.* None specified.
Penalties	*Civil.* Any violation may carry a penalty of up to $50,000 per day of violation. Any intentional or unintentional discharge of 100,000 gallons or more of oil or petroleum of any kind carries a penalty of up to $10,000,000. *Criminal.* A fine of up to $50,000 per day or imprisonment or both for any negligent violation or any falsification of documents, or tampering with monitoring devices. A fine of up to $100,000 per day of violation for any second offense. A fine of up to $250,000 per day of violation or imprisonment, or both for any purposeful, knowing or reckless violation that causes significant environmental effect. A fine of up to $75,000 per day of violation or imprisonment, or both for any purposeful, knowing or reckless false statement, representation or certification. A person who purposely or knowingly violates a condition of a permit, or who discharges without a permit and knowingly places another in imminent danger of death or serious bodily injury shall be subject to a fine of not less than $50,000 nor more than $250,000, or, in the case of a corporation, a fine of not less than $200,000 nor more than $1,000,000, or by imprisonment or by both.

NEW JERSEY

Prevention and Control

Financial Responsibility	Compliance with federal financial responsibility requirements.
Spill Contingency Plan	None specified.
Manning and Equipment	Regulations concerning booming of vessels for oil transfers.
Notification	All persons subject to liability must immediately notify the Department of Environmental Protection.
Inspection	Police may inspect vessels to assure compliance with financial responsibility requirements.

NEW YORK

Law(s)	*Title.* Oil Spill Prevention, Control, and Compensation Law; and Spills of Bulk Liquids Law *Cite.* Navigation Law, Article 12, §170; Environmental Conservation Law, Article 71, §1941. *Year Enacted.* 1978; 1973. *Recent Amendments.* 1989, 1990 and 1991; 1973, 1983.
	Liability
Vessel Owner or Operator	Yes ("any person who has discharged petroleum, including oil, fuel oil and other types of oil products").
Other Responsible Parties	The owner of more than 1100 gallons of petroleum stored in bulk.
Basis for Liability	Strict.
Limitation on Liability	Yes. Limited to $300 per gross ton, except no limitation where the discharge was due to gross negligence or willful misconduct, or due to the gross or willful violation of a safety construction or operating standard or regulation.
Damages	*Cleanup Expenses.* All cleanup and removal costs. *Natural Resources.* Direct and indirect damages. *Property.* Direct and indirect damages.
Penalties	*Civil.* Any violation may carry a penalty of up to $25,000 per day of violation. A violation of the booming requirements will subject a violator to a fine of $50,000 if the transfer involves 1 million gallons or more. *Criminal.* None specified under the Navigation Law but the New York Environmental Conservation Law provides that if a violation is intentional, knowing, reckless or criminally negligent, the responsible party commits a misdemeanor and is subject to a fine of $2,500 to $25,000 per day of violation, imprisonment of one year, or both. For a second offense, the responsible party will be subject to a fine of up to $50,000 per day of violation, imprisonment up to 2 years, or both.
	Prevention and Control
Financial Responsibility	No statutory requirement but a Department of Environmental Conservation regulation requires proof of $300 per gross ton for vessels in the forms of an insurance policy, self-insurance of surety bonds.
Spill Contingency Plan	Habitat Protection Plan is required.
Manning and Equipment	The Commissioner of Environmental Conservation may establish standards for vessels carrying petroleum within State waters. Certain regulations

NEW YORK

	could require the use of containment booms during transfers of petroleum products. Presently, at any transfer occurring after sunset or before sunrise adequate lighting is required.
Notification	Any person responsible for causing the discharge must give notice to the Department of Transportation no later than two hours from the time of the spill.
Inspection	The Department of Environmental Protection can inspect sources that could potentially cause discharge.

NORTH CAROLINA

Law(s)	*Title.* Oil Pollution and Hazardous Substances Control Act.
	Cite. North Carolina Statutes, Article 21A, §143-215.75 et seq. and §143-215.94N et seq.
	Year Enacted. 1978.
	Recent Amendments. 1989

Liability

Vessel Owner or Operator	Yes.
Other Responsible Parties	Cargo owner and charterer.
Basis for Liability	Strict.
Limitation on Liability	None specified.
Damages	*Cleanup Expenses.* All costs of cleanup and removal.
	Natural Resources. Costs of restoration and rehabilitation, and loss of income due to damage or destruction of natural resources. Responsible party must immediately restore affected are to pre-discharge condition.
	Property. Injury to real and personal property, loss of income due to such damage and, where injured party is a state, the costs to assess and monitor cleanup operation and the loss of tax revenues.
Penalties	*Civil.* A penalty of up to $250,000 per day will be imposed for failure to notify the Division of Emergency Management of a discharge over 50,000 gallons. A penalty up to $5,000 per violation may be imposed for an intentional or negligent discharge of oil.
	Criminal. The willful or knowing discharge of oil is a felony punishable by three years imprisonment and a fine of up to $100,000 per day of violation, up to $500,000. The discharge made with knowledge that it poses a threat of serious bodily injury will subject responsible party to a fine of up to $250,000 per day of violation, up to $1,000,000, and imprisonment of up to ten years.

Prevention and Control

Financial Responsibility	Although there is no requirement to produce evidence of financial responsibility, if sufficient surety or cash deposit is made, the State will have no lien upon the vessel.
Spill Contingency Plan	None specified.
Manning and Equipment	None specified.

NORTH CAROLINA

Notification	Owner or person in control of the vessel must immediately notify the Department of Environmental, Health and Natural Resources about the discharge. Responsible party must also notify the Division of Emergency Management.
Inspection	The Commission and its employees may board any vessel for the purpose of investigation, or to conduct any activity to contain, collect or remove oil.

OHIO

Law(s)	*Title.* Ohio Water Pollution Control Act.
	Cite. Ohio Revised Code, Title 61, Chapter 6111.
	Year Enacted. 1988.
	Recent Amendments.
	Liability
Vessel Owner or Operator	Yes ("any person who causes pollution or places or causes to be placed any sewage, industrial waste, or other wastes in a location where they cause pollution").
Other Responsible Parties	None.
Basis for Liability	Public nuisance.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* Once the Director determines that an emergency exists, actions including cleanup and removal operations could be required.
	Natural Resources. All rights of action or remedies in equity or under the common law are available.
	Property. All rights of action or remedies in equity or under the common law are available.
Penalties	*Civil.* Any violation of §6111.01 to 6111.08 or of any order or regulation will carry a penalty of up to $25,000 and/or up to one year prison. Knowingly submitting false information or failure to submit such information concerning a discharge will carry a penalty of up to $25,000.
	Criminal. Attorney General has the power to prosecute any violation under the statute. A fine of up to $25,000, imprisonment of up to one year, or both, is the penalty for the discharge of oil without a permit.
	Prevention and Control
Financial Responsibility	None specified.
Spill Contingency Plan	In connection with the issuance of permits, the director may require submission of plans, specifications and other information.
Manning and Equipment	None.
Notification	None.
Inspection	Director of Environmental Protection has the authority to enter any property to investigate or inspect conditions relating to pollution of State waters.

OREGON

Law(s)	*Title.* Oil Spillage Regulation; and Spill Response and Cleanup of Hazardous Materials. *Cite.* Oregon Revised Statutes Annotated, Vol. 8, Title 34, Chapter 468, §468.780 et seq. and Chapter 466, §466.605 et seq.. Also Oregon Administrative Rules, Chapter 340, Division 47. *Year Enacted.* 1977 (OSR) and 1985 (SRCHM). *Recent Amendments.* 1989.
	Liability
Vessel Owner or Operator	Yes ("any person owning or having control over any oil or hazardous material spilled or released, or threatening to spill or release").
Other Responsible Parties	Cargo owner.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* Liability for the reimbursement of all monies expended by the Department of Environmental Quality, where responsible party has failed to immediately collect and remove oil, or take all action to contain, treat and disperse the oil. *Natural Resources.* Liability for any damages to public property. *Property.* Damages to private and public property.
Penalties	*Civil.* Willful or negligent discharge of oil carries a penalty in an amount commensurate with amount of damages caused. Failure to make good faith effort to clean up a spill will subject responsible party to a fine or up to three times the amount incurred by the State. *Criminal.* None specified.
	Prevention and Control
Financial Responsibility	Any ship over 300 gross tons which transport oil in bulk as cargo, must show financial responsibility in the amount of the greater of $1,200 per gross ton or $2,000,000 for ships of 3,000 gross tons or less; and $1,200 per gross ton or $10,000,000 for ships over 3,000 gross tons. For other covered ship over 300 gross tons, evidence of financial responsibility in the amount of the greater of $600 per gross ton or $500,000.
Spill Contingency Plan	Yes.
Manning and Equipment	Yes.

OREGON

Notification	Yes.
Inspection	Yes.

PENNSYLVANIA

Law(s)	*Title.* The Clean Streams Act. *Cite.* Pennsylvania Statutes Annotated, Title 35, §691.1-691.8 and §691.401-691.1001. Also Title 25, Rules and Regulations, part I, Subpart C., Article II, Chapter 101. *Year Enacted.* 1970. *Recent Amendments.*
	Liability
Vessel Owner or Operator	Yes ("any person who puts or places into any of the waters of the Commonwealth . . . any substance resulting in pollution").
Other Responsible Parties	None.
Basis for Liability	Nuisance.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All actions that constitute a nuisance must be abated provided by law or equity. The Commonwealth may bring an action against any person who caused pollution or violated a provision of the Act. *Natural Resources.* Same as above. *Property.* Same as above.
Penalties	*Civil.* Any violation of the Act or its regulations carries a penalty of up to $10,000 per day of violation. *Criminal.* A violation of the Act or its regulations constitutes a summary offense and carries a penalty of at least $100 but not more than $10,000. Imprisonment for ninety days will occur upon non-payment. Willful or negligent violation of the Act or its regulations or any order of the Department of Environment constitutes a third degree misdemeanor and carries a fine of at least $2,500 but not more than $25,000 or imprisonment for not more than one year, or both. A subsequent violation within two years of the initial offense doubles the initial potential maximum penalty.
	Prevention and Control
Financial Responsibility	None specified.
Spill Contingency Plan	None specified.
Manning and Equipment	None specified.
Notification	Yes.
Inspection	None specified, except that upon filing of a written complaint the Sanitary Water Board can investigate the source of pollution.

PUERTO RICO

Law(s)	*Title.* Water Pollution Control Act
	Cite. Health Sanitation Code, Chapter 35, § 591 et seq.
	Year Enacted. 1950.
	Recent Amendments.
	Liability
Vessel Owner or Operator	Yes ("persons who directly or indirectly discharge or permit the discharge of oil").
Other Responsible Parties	None.
Basis for Liability	Commonwealth has a chose of action against any person who violates the Act.
Limitation on Liability	None.
Damages	All choses of action inure to the benefit of the Commonwealth only. Act shall not be construed as creating new rights to property owners or private entities, nor as increasing the rights already existing.
Penalties	*Civil.* None specified.
	Criminal. Any person who discharges or permits the discharge of oil into the Commonwealth's waters may be subject to a penalty of up to $1,000 per day of violation and imprisonment of one year.
	Prevention and Control
Financial Responsibility	None specified.
Spill Contingency Plan	None specified.
Manning and Equipment	None specified.
Notification	None specified.
Inspection	None specified.

RHODE ISLAND

Law(s)	*Title.* Water Pollution Control Law. *Cite.* General Laws of Rhode Island, Volume 7A, Chapter 12, §46-12-1 et seq. Also Oil Pollution Control Rules & Regulations (adopted 1957, revised 1987, 1990 and 1991). *Year Enacted.* 1920. *Recent Amendments.* 1990.
	Liability
Vessel Owner or Operator	Yes (any "person" who violates this law, including the owner and operator of a vessel and their agents).
Other Responsible Parties	None.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* Costs of detection, investigation, correction of the violation. *Natural Resources.* Compensation for all adverse environmental effects resulting from the violation and monies required to restock affected land or waters, replenish damaged or degraded resources, or general restoration of the environment to condition prior to injury. *Property.* None specified.
Penalties	*Civil.* Statutory penalties are $25,000 per day of violation, and non-exclusive allowing unlimited liability. Administrative penalties up to $25,000 per day of violation. Failure to prove financial responsibility carries a fine in an amount the greater of $100,000 or twice the money needed to cure any environmental injury. *Criminal.* For willful or criminally negligent violation, a fine of up to $25,000, imprisonment up to 5 years, or both. Knowing falsification or knowingly tampering with monitoring devices, a fine up to $5,000 for each violation, imprisonment up to 30 days, or both. For violation of the Oil Pollution Control Act, a fine up to $25,000, imprisonment up to five years, of both. Each day during which the violations occur constitute distinct and separate offenses. Knowingly making a false statement, a fine up to $25,000 for each instance of violation, imprisonment up to 5 years, or both. Failing to provide information or providing false information constitutes a misdemeanor.
	Prevention and Control
Financial Responsibility	Vessels of 1,000 gross tons or more, with capacity to load a 12 foot draft are required to show proof of financial responsibility up to $1,200 per gross ton of weight of the vessel and its cargo. Full extent of the bond is

RHODE ISLAND

	forfeited if vessel damages the environment.
Spill Contingency Plan	None specified.
Manning and Equipment	The Department of Environmental Management can, if there is no alternative, contract with private organization to provide personnel, equipment and services required to carry out the purposes of the law.
Notification	Yes. Responsible persons shall immediately begin containment of spill, notify the Department, and prove financial responsibility.
Inspection	Director can inspect, make regulations and direct all methods, means and devices employed on a vessel. Director may board and inspect a vessel upon the master's failure to provide a Coast Guard Certificate of Compliance.

SOUTH CAROLINA

Law(s)	*Title.* Water Pollution Act *Cite.* Code of Laws of South Carolina Annotated, Title 48, Chapter 1, §48-1-90 and Chapter 43, Article 3, §48-43-510 et seq. *Year Enacted.* 1962 (Chapter 1) and 1977 (Chapter 43). *Recent Amendments.*
	Liability
Vessel Owner or Operator	Yes ("any person who discharges pollutants into the waters of the State").
Other Responsible Parties	None.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All expenses by the State to cleanup and remove oil. *Natural Resources.* Damages due to injury to or destruction of fish, shellfish and wildlife as may be proved. *Property.* Damages to private property to be determined by arbitration panel. Damages may also be recoverable pursuant to a common or statutory law right unless an application for arbitration has already been filed. *Other.* Damages for other injuries resulting from the spill shall be determined by the arbitration panel or may be recovered through additional common or statutory law action where no application for arbitration has been filed.
Penalties	*Civil.* Any violation of Chapter 43 carries a penalty of up to $5,000 per violation per day. Any violation of Article 3 carries a penalty of up to $10,000 per day. Any violation of Chapter 1 carries a penalty of up to $10,000 per day. Any false statement or tampering with monitoring equipment is penalized under Chapter 1. *Criminal.* The willful violation of Chapter 43 is a misdemeanor and may subject the violator to a fine of not more than $1,000 or imprisonment of not more than six months, or both. Any false statement or tampering with monitoring equipment subjects a person to criminal penalties under Chapter 1. A willful or negligent violation of Chapter 1 is a

SOUTH CAROLINA

misdemeanor and carries a fine of not less than $500 nor more than $2,500 per day or imprisonment for two years, or both.

Prevention and Control

Financial Responsibility	None specified.
Spill Contingency Plan	None specified.
Manning and Equipment	None specified.
Notification	Yes.
Inspection	None specified.

TEXAS

Law(s)	*Title.* Oil Prevention and Response Act of 1991.
	Cite. Texas Natural Resources Code, Chapter 40.
	Year Enacted. 1991.
	Recent Amendments.
	Liability
Vessel Owner or Operator	Yes ("any other person who causes, allows or permits an unauthorized discharge").
Other Responsible Parties	Possibly charterer, but statutory language is ambiguous.
Basis for Liability	Strict.
Limitation on Liability	*Response Costs.* Liability for discharge from a vessel of 300 gross tons or less which does not carry oil as cargo is not to exceed $1,000,000. Liability for discharge from a vessel of 8,000 gross tons or less is not to exceed $5,000,000. Liability for discharge from a vessel greater than 8,000 gross tons, is not to exceed $600 per gross ton up to $50,000,000. *Natural Resources Damages.* No limitation. *Damages Other than Natural Resources Damages.* Liability for discharge from a vessel of 300 gross tons or less which does not carry oil is not to exceed $1,000,000. Liability for discharge from a vessel of 8,000 gross tons or less is not to exceed $5,000,000. Liability for discharge from a vessel greater than 8,000 gross tons is not to exceed $600 per gross ton up to 50,000,000. Limitations on liability do not apply if the discharge was caused by gross negligence or willful misconduct; if the discharge is not eligible for expenditure from the Federal Oil Spill Liability Trust Fund; or if the responsible party fails to cooperate with response operations.
Damages	*Cleanup Expenses.* All costs incurred in preventing, abating, containing and removing pollution or vessels, and in limiting damage to public welfare. *Natural Resources.* Costs to assess, restore, or replace damaged resources, or mitigate further damage. Includes compensation to third parties for loss or injury to natural resources. *Property.* Compensation to third parties for loss or injury to property; to governments for direct loss of taxes and cost of public services; or to members of the commercial fishing community for loss of income, profits or earning capacity.

TEXAS

Penalties	*Civil.* A responsible person who knows or has reason to know of discharge and fails to notify is subject to a fine of not less than $500 nor more than $250,000 for a natural person and $500,000 for a corporation. Responsible person shall pay a fine of not less than $250 nor more than $25,000 per day or not more than $1,000 per barrel discharged. A responsible person who fails to contain and remove pollution as required by regulations is subject to a fine of not more than $25,000 per day or three times the response costs incurred by the fund. A violation of any rule issued pursuant to the Act is penalized by not less than $100 nor more than $10,000 per violation per day up to $125,000. *Criminal.* Operating a vessel or terminal facility without a prevention and response plan or proof of financial responsibility; intentionally discharging oil; fraudulent reporting; taking a vessel involved in a discharge out of Texas without proving financial responsibility, and failing to report a discharge all constitute misdemeanors. Making a material false statement in filing a claim or reporting a discharge with fraudulent intent constitutes a third degree felony.
	Prevention and Control
Financial Responsibility	All vessel subject to the Act and operating within the coastal waters of the State shall maintain evidence of financial responsibility for costs and damages.
Spill Contingency Plan	Vessels with capacity of 10,000 gallons or more of oil shall maintain a written discharge prevention and response plan specific to the vessel pursuant to the rules promulgated by the Act.
Manning and Equipment	All vessels must provide all required equipment and personnel to prevent, abate and remove pollution as provided in the contingency plan.
Notification	Yes.
Inspection	Commissioner may subject any vessel under the Act as a condition to entering any port of the State to an unannounced inspection, audit or drill to determine the discharge prevention and response capabilities of the vessel.

UNITED STATES VIRGIN ISLANDS

Law(s)	*Title.* Oil Spill Prevention and Pollution Control Act.
	Cite. United States Virgin Islands Code, Title 12, Chapter 17.
	Year Enacted. 1974.
	Recent Amendments.
	Liability
Vessel Owner or Operator	Yes ("any licensee and its agents or servants, including vessels destined to or leaving a licensee's terminal facility, who permits or suffers a prohibited discharge").
Other Responsible Parties	None.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All costs of abatement and cleanup.
	Natural Resources. Damages due to rehabilitation of wildlife.
	Property. None specified.
	Other. Administrative expenses.
Penalties	*Civil.* Any violation of the Act or its regulations carries a penalty of up to $50,000 per day.
	Criminal. Failure to notify the proper parties of a discharge shall is penalized by up to $10,000.
	Prevention and Control
Financial Responsibility	Statutory requirements of evidence of financial responsibility in amounts established by regulations which have not yet been promulgated.
Spill Contingency Plan	To be established by regulation.
Manning and Equipment	To be established by regulation.
Notification	Immediate notification of a discharge to the Harbor Master and to the nearest Coast Guard station is required.
Inspection	No statutory requirement but the Virgin Islands Environments Department has authority to regulate operation and inspection of vessels.

VIRGINIA

Law(s)	*Title.* Virginia Water Control Law. *Cite.* Code of Virginia, Title 62.1, Chapter 3.1. *Year Enacted.* 1990. *Recent Amendments.* 1992.

Liability

Vessel Owner or Operator	Yes ("any person causing or permitting a discharge of oil into Commonwealth waters, . . . or causing or permitting a substantial threat of such discharge").
Other Responsible Parties	Charterer, but statutory language is ambiguous.
Basis for Liability	The Commonwealth is not required to plead or prove negligence.
Limitation on Liability	Yes. Limited to the greater of the amount of financial responsibility required by the Act (i.e. $500 per gross ton) or $10,000,000. No limit of liability shall apply if discharge or threat of discharge is caused by gross negligence or willful misconduct, or by violation of a safety, construction or operation regulation. No limit of liability shall apply if the responsible person failed to report the discharge or failed to cooperate in or affect containment and cleanup.
Damages	*Cleanup Expenses.* All costs of investigation, containment and cleanup. *Natural Resources.* Compensation for the loss of any natural resources that cannot be restocked, replenished or restored. *Property.* To the Commonwealth or any political subdivision, damages to property, loss of tax or other revenues. To any person for injury or damage to person or property, loss of income, loss of means of producing income or loss of the use or damage to property for recreational, commercial, industrial, agricultural or other uses.
Penalties	*Civil.* For failing to obtain approval of an oil discharge contingency plan, $1,000 to $50,000 for the initial violation and $5,000 per day thereafter. For failing to maintain evidence of financial responsibility, $1,000 to $100,000 for initial violation and $5,000 per day thereafter. For discharging oil or owning or operating any facility or vessel from which such discharge originates, up to $100 per gallon of oil discharged. For failing to cooperate in containment and cleanup or to report a discharge, not less than $1,000 nor more than $50,000 for the initial violation and $10,000 per day thereafter.

VIRGINIA

Criminal. Knowing violations are a misdemeanor punishable by a fine up to $100,000, imprisonment up to 1 year, or both.
Knowingly and willfully making a false statement is a felony punishable by a fine up to $100,000, imprisonment of one to three years, or both.
Negligent discharge is a misdemeanor punishable by a fine up to $50,000, imprisonment up to one year, or both.
Knowingly and willfully discharging oil is a felony punishable by a fine up to $100,000, imprisonment of one to ten years, or both.
Subsequent violations are felonies punishable by a fine up to $200,000, imprisonment of two to ten years, or both.
Upon conviction of any violation, a violator who is not an individual shall be sentenced to pay a fine of not more than the greater of $1,000,000 or an amount that is three times the economic benefit realized by the violator from the offense.

Prevention and Control

Financial Responsibility	Operator of tank vessel shall deposit with the Board an amount of $500 per gross ton of such vessel (requirements effective 90 days after regulations are promulgated). Operator of tank vessel will be exempt from the requirement if he can maintain evidence of financial responsibility in an amount equal to the cash deposit, demonstrated by self-insurance, insurance, guarantee or surety, or combination thereof. Operator and insurer must appoint an agent for service of process in the Commonwealth; insurer must be authorized to engage in insurance business in the Commonwealth; and insurance instrument must provide for direct action against the insurer or guarantor. No requirement of proof of financial responsibility for a facility or tank vessel having a maximum capacity of less than 15,000 gallons of oil.
Spill Contingency Plan	Yes.
Manning and Equipment	None specified.
Notification	The Board and the appropriate federal authorities must be notified immediately upon learning of discharge or threat of discharge.
Inspection	The Board may investigate and inspect in order to ensure compliance with all standards, rules or orders adopted.

WASHINGTON

Law(s)	*Title.* Navigation and Harbors Law, and Water Pollution Control Law. *Cite.* Revised Code of Washington, Chapters 88, §88.40.050 et seq. and Chapter 90, §90.48.010 et seq. *Year Enacted.* 1969. *Recent Amendments.* 1990 and 1991.
	Liability
Vessel Owner or Operator	Yes ("any person who without authority discharges into State waters anything tending to cause pollution").
Other Responsible Parties	Cargo owner.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All necessary expenses for oil cleanup, including costs of investigation, removal, containment and treatment of oil. *Natural Resources.* Compensation to State pursuant to a schedule for unquantifiable damages or for damages not quantifiable at a reasonable cost for any adverse environmental, recreational aesthetic, or other effects caused by the discharge.
Penalties	*Civil.* Administrative penalties may be imposed for failure to comply with prevention plan. Up to $100,000 may be imposed on a tank vessel that transfers oil to an onshore or offshore facility which does not have an approved contingency plan, a spill prevention plan or evidence or financial responsibility. Penalties of up to $20,000 for each negligent violation and per day. Additional civil penalties of $10,000 per day for unauthorized discharges. A penalty of up to $100,000 per day for intentional or reckless discharge. A penalty of up to $10,000 for failure to meet financial responsibility requirements. *Criminal.* Operating a covered vessel without an approved contingency plan or prevention plan, or evidence of financial responsibility constitutes a gross misdemeanor. A subsequent conviction constitutes a felony. Recklessly operating a vessel which causes the release of oil constitutes a felony. Operating a vessel while intoxicated constitutes a felony. Failure to pay taxes on oil deposited at a marine terminal is a misdemeanor.

WASHINGTON

A willful violation is punishable by up to $10,000 and costs of prosecution, or by imprisonment up to one year, or both.

Prevention and Control

Financial Responsibility

Oil tankers and inland barges carrying oil or hazardous substances in bulk must show financial responsibility in the greater of $1,000,000 or $150 per gross ton.
Tank vessel carrying oil cargo in bulk must show financial responsibility of at least $500,000,000.
Barges of 300 gross tons or less may have to comply with lesser standards.
Cargo or passenger vessels carrying oil as fuel must demonstrate financial responsibility to pay the greater of $600 per gross ton or $500,000.
There is no financial responsibility requirement for owners or operators of tank vessels who are members of an international protection and indemnity mutual organization and have coverage for oil pollution risks up to the amounts required by this statute.

Spill Contingency Plan

The Department of Ecology must have in place a state-wide Master Oil and Hazardous Substance Spill Prevention and Contingency Plan.
It is required to submit plans for the prevention, containment and clean up of spills for tank vessels and barges carrying oil in bulk, cargo and passenger vessel 300 gross tons or greater, and oil processing and storage facilities near navigable water which receive oil from a tank vessel.

Manning and Equipment

Anyone conducting shipping, fueling and bunkering operations, or engaging in the lightering of petroleum products, and anyone transferring oil between onshore or offshore facility and tank vessel must have containment and recovery equipment readily available.

Notification

Owner or operator of tank vessel or barge must notify the coast Guard within one hour of the disability of a vessel if vessel is within 12 miles of the shore, and of a collision or near miss collision if within 12 miles of the shore.

Inspection

Tank vessels entering State waters are subject to inspection to ensure their compliance with applicable standards.
The State has a right to review the federal inspection process for thoroughness.

WISCONSIN

Law(s)	*Title.* Pollution Discharge Elimination Statute. *Cite.* Wisconsin Statutes Annotated, Chapter 147, §147.01 et seq. *Year Enacted.* 1973. *Recent Amendments.*

Liability

Vessel Owner or Operator	Yes ("any person who violates a provision of Chapter 147").
Other Responsible Parties	None.
Basis for Liability	Strict.
Limitation on Liability	None.
Damages	*Cleanup Expenses.* All costs of cleanup and removal. *Natural Resources.* Expenses of rehabilitating the adverse effects upon the water environment, including the cost of replacing the wildlife destroyed. *Property.* None specified.
Penalties	*Civil.* Any violation carries a fine of not less than $10 per day nor more than $10,000 per day. A court may impose an additional penalty equal to a portion of or all of the cost of the investigation and monitoring that established the violation. *Criminal.* A willful or negligent violation may be fined by not less than $10 per day nor more than $25,000 per day, or imprisonment for not more than six months, or both. Knowingly making a false statement in any application or other document filed or maintained, or tampering with monitoring equipment carries a fine of not less than $10 nor more than $10,000, or imprisonment for six months, or both. Criminal penalties can be imposed directly upon responsible corporate officers. A court may impose an additional penalty equal to a portion of or all of the costs of investigation and monitoring that established the violation.

Prevention and Control

Financial Responsibility	None specified.
Spill Contingency Plan	None specified.

WISCONSIN

Manning and Equipment	None specified.
Notification	Yes.
Inspection	A representative of the Department of Natural Resources can inspect a point source (typically discharges from industrial plants) to check monitoring equipment and methods.

APPENDIX III

DESIGN AND COST CONSIDERTIONS IN THE NAS STUDY

This Appendix provides additional information on the comprehensive 1991 study by the National Academy of Sciences, *Tanker Spills: Prevention by Design*. See also Chapter 4, Section I in the main body of this report.

It does not aim to give an in-depth review of all new ship design proposals -- excellent descriptions are contained within the NAS study -- but aims solely to provide sufficient grounding to enable readers to follow the inevitable further debates over the two most favored designs: double hulls and the mid-deck tankers.

Section I. DESIGN CONSIDERATIONS

The most basic small tanker is essentially one covered oil tank with an engine. As size increases the number of separate tanks increases. The tanks are defined by transverse partitions (bulkheads) along the hull -- the minimum number defined by structural requirements, the maximum by operational requirements (generally crude tankers have fewer tanks, product tankers have more, chemical tankers the most). Above 50,000 dwt most tankers have, in addition, two longitudinal bulkheads, which multiplies the number of tanks by three. The dimensions of the tanker are dictated in part by international legal requirements and in part by individual preference.

MARPOL set a precedent by forcing retro-fitting in many cases, in order to meet new equipment requirements: for inert gas systems (IGS) and either SBT or COW facilities. A substantial, but inevitably declining portion of the world fleet is exempt from these requirements because of age. According to Clarkson's Research Studies Limited, in 1990 about 35% of the world tanker fleet of more than 10,000 dwt has SBT,

and about half of those have protectively-located SBT's, and thus meet full MARPOL requirements.

Size and arrangements of cargo tanks are significant issues in the design of double-bottomed, double-sided, and double-hulled ships. All ships must be designed to have a certain reserve buoyancy in the event of any compartment, or specified number of compartments flooding, as well as sufficient "damage stability" to withstand the effects of flooding within a certain range of heel and trim[1]. All tankers must carry sufficient ballast to maintain a minimum draft. The figure on the next page illustrates various hull and tank configurations, each of which react differently to certain types of collision.

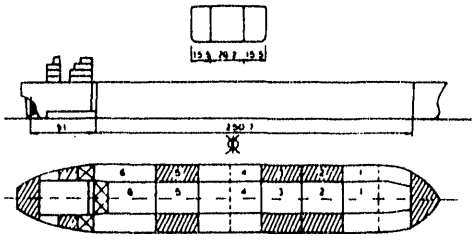
The conventional MARPOL tanker is designed to withstand side damage that penetrates up to one-fifth of the ship's beam (B/5). SBT's are located between the outer hull and longitudinal bulkhead; exact locations vary with individual designs, but it is common to have alternate wing tanks dedicated to cargo and ballast. The conventional MARPOL tanker is treated as the base-case against which other more advanced designs are evaluated.

Because the minimum segregated ballast requirements and damage stability assumptions apply to all designs, a double-sided, single-bottomed tanker built with B/5 wing tanks would suffer a 20% reduction in cargo capacity over the basic MARPOL design. To reduce this handicap the segregated ballast wing tanks on a double-sided ship are typically in the B/9 - B/11 range, which results in the same volume of segregated ballast as the MARPOL design (because additional ballast is carried in the two double-sides). Such configuration still allows damaged stability requirements for a B/5 penetration to be met. The height of a double bottom is usually B/15, except in the smallest and largest tankers, and a double-hulled ship meets MARPOL ballast and stability requirements if there is a standard B/15 gap between inner and outer hulls. This results in virtually no loss of carrying capacity compared with the basic MARPOL SBT design. Variation in the height of double-bottoms is usually restricted to a range between 2 and 3 meters, the ideal space for inspection purposes. Bottom spaces can exceed three meters on large vessels -- it allows all structural components to remain within the double-bottom -- but those operators with much experience of double bottomed ships strongly favor a 2 - 3 meter gap.

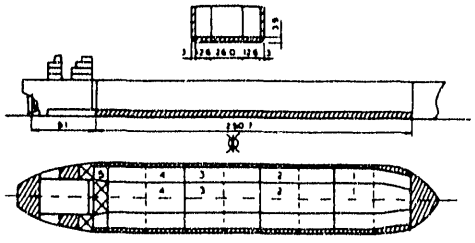
The figure on the next page shows a basic configuration for the mid-deck design. The deck, a horizontal bulkhead, is essentially a high double bottom that is loaded with oil. The immediate apparent benefit is that loss of oil from bottom penetration would be less than for other designs, but in addition there are considerable hydrostatic advantages.

[1] Bow-to-stern and side-to-side shifts.

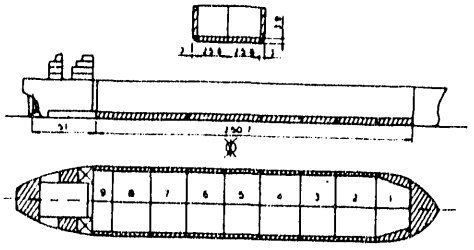
Alternative Tanker Designs



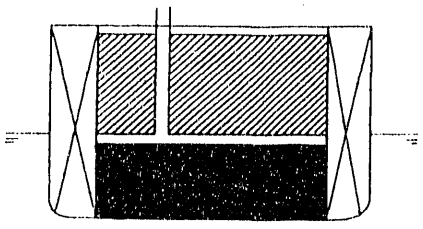
Modern Conventional VLCC
w/Segregated Ballast Tanks



Double Side/Double Bottom (A)



Double Side/Double Bottom (B)



Schematic of Intermediate Oil-Tight Deck
with Double Sides (Mid-Deck)

Source: NAS, *Tanker Spills: Prevention by Design*

Figure 1

The mid-deck tanker was the only design considered by the NAS study over which the committee strongly disagreed. The principle argument against it is that it remains theoretical and unproven, though there are no technological barriers to construction.

To meet MARPOL SBT requirements, this design would require twice the space between the double sides than a double-hulled ship -- a decided advantage in some collisions. In the event of a bottom rupture, loss of cargo would be less than that for a conventional tanker operating with hydrostatically-loaded cargo. The NAS committee found that the mid-deck tanker would offer less protection than the double-hulled vessel in low energy groundings, where the double-hull would not spill oil at all, but more protection in high energy groundings when the inner-hull of a double-hull ship would be pierced.

Section II. COSTS

Of the 17 tanker design concepts evaluated by the NAS Committee, 9, including existing single hull designs, were deemed to be worthy of serious consideration from an engineering perspective and received full technical and cost evaluations. This section summarizes the cost findings. The study based its cost calculations on the assumptions that

1) capital costs are repaid over 20 years at 12.5% interest.
2) the annual volume of oil moved by tank vessels in U.S. waters is 600 million tons carried as follows:

Imports: 350 million tons carried in 80,000 dwt tankers, undertaking round trip voyages of 8,000 miles.

Coastal movements: 150 million tons, carried in 40,000 dwt tankers on round trip voyages of 2,000 miles.

Alaska shipments: 100 million tons, carried in 240,000 dwt tankers on round trips averaging 4,000 miles.

The results were intended to be indicative only. Although variations in such things as fuel consumption, insurance premia, and maintenance costs were factored into the calculations, the elements of voyage and operating costs subject to variations between designs generally represented only 20 to 25% of total annual costs. As these variations did not exceed 5% of the total cost, the study concludes that cost differentials associated with pollution resistant tankers lies mainly in capital costs. (The only cost element to increase significantly since the Committee's calculations were made is insurance costs, but these remain a very small portion of the total costs involved. See Chapter 6).

The base case, the modern, single-hulled tanker meeting all MARPOL requirements, is clearly the cheapest. The most expensive option, a double-hulled tanker built to incorporate hydrostatic control features, would add $3.41 per ton to the average cost of carrying oil to the U.S. -- just over 1¢ per gallon over the base case -- given the carrying assumptions noted above. For oil carried in VLCC's the difference in transportation costs between the standard MARPOL tanker and either a double-hulled tanker or an mid-deck tanker is only 60 to 70¢ per ton.[2]

A cost benefit analysis was impossible: firstly, there is no such thing as a standard oil spill, secondly, even if there were, it would be impossible to quantify the benefit of its prevention. The NAS study took a dual approach to circumvent the problem, in order to evaluate the alternative designs. A cost-effectiveness analysis compares the costs shown in the table to performance (measured in terms of the likely spill reduction over the base, MARPOL tanker case) for each of the designs. The assessment of spill reduction took into account the probability of both high and low impact collisions and groundings.

To complement the cost effectiveness analysis, an "expert judgment technique" aggregated the opinions of individual members of the committee after they had rated and weighted each design aspect of each of the alternatives. The report's conclusions on the ship design issue reflect the result of both approaches. The cost-effectiveness analysis shows that the most costly ways to prevent oil spills are to use tankers with double sides, or with double hulls with hydrostatic controls. Double-sided ships with hydrostatic balance, and MARPOL ships using hydrostatic balance, are described as medium cost approaches to spill prevention. The remaining four alternatives: double-hulls, small tanks, double bottoms and the mid-deck tanker, cannot be distinguished on a cost basis. The expert judgment technique resulted in four designs being favored: double-hulls with and without hydrostatic control, double sides with hydrostatic control, and the mid-deck.

[2] PIRINC estimates that for a VLCC employed on the AG - LOOP trade, outbound via the Cape inbound via Suez, this annual increment for a double-hulled vessel would be approximately $1.82/ton in 1992. If the ship were employed on regular eight thousand mile round trips, the added cost to each delivered ton of oil would be $1.00 (14¢/Bbl).

COSTS OF U.S. CRUDE IMPORTS USING NEW TANKERS

Design	Ship Size ('000 DWT) 40		80		240		
	Newbuilding Cost ($/Mil)	Total Transp. Cost ($/ton)	Newbuilding Cost ($/Mil)	Total Transp. Cost ($/ton)	Newbuilding Cost ($/Mil)	Total Transp. Cost ($/ton)	Avg Cost to U.S. Imports ($/ton)
Marpol	34.0	4.33	49.7	10.30	89.6	3.65	7.68
Marpol with Hydrostatic Control	34.0	5.34	49.7	12.71	89.6	4.51	9.48
Double Sides	35.7	4.69	52.2	11.02	95.9	3.97	8.24
Double Sides with Hydrostatic Control	42.8	5.34	63.7	12.76	115.0	4.56	9.51
Double Bottom	37.7	4.77	55.7	11.31	101.3	4.06	8.45
Small Tanks	36.2	4.74	53.8	11.25	97.0	4.01	8.39
IOTD w/DS*	41.4	5.19	60.7	12.23	108.8	4.35	9.13
Double Hull	39.4	5.01	58.2	11.87	105.7	4.26	8.86
Double Hull with Hydrostatic Control	47.3	5.76	80.0	15.19	126.7	4.93	11.09

Source: National Academy of Science, *Tanker Spills: Prevention by Design*

* The study notes that the capital costs used for this design -- The Intermediate Oil Tight Deck with Double Sides -- may be too high: "A definitive study...showed that the estimated capital cost differential over base (MARPOL) is the same, or slightly less, than for double hull designs."

APPENDIX IV. CVM AND NRDA

As discussed in Chapter 4, the National Oceanic and Atmospheric Administration is developing regulations to govern OPA's Natural Resource Damage Assessments. Among the most controversial aspects of the debate is the possible use of "Contingent Valuation Methodology" for estimating "nonuse" damages. This Appendix reports on several actual CVM studies used for specific damage estimates. The examples illustrate the concerns raised by CVM.

The *Nestucca* Spill: $3.5 million becomes $150 million

A review of actual applications of CVM demonstrates how its use is cause for shipowner concern. In the case of a barge spill off Washington State, for instance, the barge towing company settled resource damage claims with the State of Washington and the Federal government for $3.5 million. A subsequent CVM study estimated the average household WTP in British Columbia at $39-$151 (US $) to prevent a similar spill in the future. When multiplied by the number of households in the province, these numbers imply damages to British Columbia residents as high as $180 million (US $).

The Nestucca spilled 231,000 gallons of residual fuel oil in December 1988, causing some oiling of the coastline in northern Washington and Vancouver Island, killing an estimated 40,000 common seabirds out of a total population of 3-4 million (no rare or endangered species were known to have been affected, and full recovery of the seabird population was expected in 5-10 years), and closing commercial shellfish harvesting for several weeks. Clean-up and wildlife restoration cost $5-10 million. As noted, the company also paid $3.5 million to settle all Federal and State resource damage claims.

The CVM study,[3] completed after settlement, asked, ". . .the most your household would be willing to pay in total over the next five years in higher prices for programs that prevent all oil spills, like those described above [large, moderate, small and very small spills with hypothetical varying impacts], in the Pacific Northwest over the next five years?" The 284 respondents in Washington indicated a mean willingness to pay ("WTP") of $521.84 per household over 5 years to prevent all spills; the 290 respondents from British Columbia indicated $425.64 (Cdn $) per household over 5 years. These results were reduced to reflect the amount which respondents stated was really for oil spill prevention rather than general environmental causes, giving a "central" estimate of $335 per household over 5 years for Washington respondents to prevent all spills and $295 (Cdn $) per household for British Columbia respondents. The "central" estimate for moderate spills, the hypothetical characteristics of which matched the facts in *Nestucca's* case, was $95 per household over 5 years for Washington respondents and $80 (Cdn $) for British Columbia respondents. A separate survey asked the willingness to pay using only the characteristics for the moderate size spills, with a resulting WTP of $175 for Washington households and $175 (Cdn $) for British Columbia households. Given the populations for the two areas, the damage assessment would be $160 million in the "low" case, $245 million for the "central" case, and $480 million for the [moderate spill only] "high" case.

The difference between the central estimate, where respondents were asked to indicate their willingness to pay to prevent all spills and then allocate that total among spills of differing size, and the high estimate, where respondents were asked only their willingness to pay to prevent a moderate-size [*Nestucca*-size] spill illustrates one of the consistent problems with CVM, *aggregation bias*. Respondents will routinely be willing to pay less for an item when it is part of a group than when it is singled out for separate treatment. The formulation of the questionnaire then becomes of paramount importance; however the sensitivity (and manipulability) of responses to design features is fatal for its usefulness in estimating damages.

Another CVM problem illustrated by the *Nestucca* result is its use in estimating damage to common, (non-unique) resources which quickly recover. It was estimated that some 40,000 *common* seabirds -- gulls, for example -- were killed, although less than one-third of this number were actually observed. It was further estimated that the regional population of the affected birds was 3-4 million, and that it would recover fully in 5 - 10 years. Whether the public actually suffered a loss, particularly a quantifiable one, under these circumstances appears debatable: people who liked to see gulls at the seashore could still do so, and people who liked to know that gulls and other seabirds were soaring offshore could still be assured they were.

---

[3] R.D. Rowe, W.D. Schulze, W.D. Shaw, D. Schenk, and L.G. Chestnut, *Contingent Valuation of Natural Resource Damage Due to the Nestucca Oil Spill*, Prepared for Dept. of Wildlife, State of WA; British Columbia Ministry of Environment; and Environment Canada, by RCG/Hagler, Bailly, Inc. June, 1991.

Navajo Generating Station: Is it 2 cents or $95? $2 million or $9.5 billion?

The unrealistic range of CVM results in studies undertaken to quantify the benefit of undiminished visibility in the Grand Canyon validates the critics' wariness toward the use of CVM to quantify the nonuse value. The Navajo Generating Station, a coal-burning facility in Arizona, 12 miles from the northern boundary of the Grand Canyon, has been required to reduce sulfur dioxide emissions to improve visibility in the Grand Canyon in the winter months.

Three CVM studies have been conducted to measure the value of similar visibility reductions. The earliest one, published in 1981,[4] was also one of the earliest uses of CVM for estimating nonuse value. It showed a willingness to pay of $95/household/-year, which would result in a total of $9.5 billion if the relevant population were deemed to be the whole U.S. Its huge estimated WTP has been discredited for cost-benefit analysis by subsequent work of its authors and others.

The second study, completed in 1990,[5] was undertaken to provide cost-benefit analysis of retrofit control technology for the Navajo Generating Station. The survey asked for respondents' WTP to preserve several national parks in the Southwest, and obtained a result of $75-127 per household, bracketing the WTP calculated for the Grand Canyon alone in the earlier study. Adjustments to the survey brought the result down to approximately *one-hundredth* of the initial level, $1.30-3.60 per household. Adjustments included:

- Allocating the amount intended for visibility improvements, as opposed to other air quality improvements;
- Allocating the amount intended for the Grand Canyon alone;
- Adjusting for the fact that the expected visibility improvement was smaller than suggested by survey photographs, for fewer periods, and for some incidences, might be imperceptible;
- Reducing the bequest value to reflect the generating station's limited lifetime; and
- Calculating net present values of the option, bequest and existence values.

---

[4] W.D. Schulze, D.S. Brookshire, E.G. Walther, and K. Kelley, *The Benefits of Preserving Visibility in the National Parklands of the Southwest*, report prepared for the U.S.E.P.A., Washington, D.C., 1981

[5] R.D. Rowe, L.G. Chestnut and M. Skumanich, *Controlling Wintertime Visibility Impacts at the Grand Canyon National Park: Social and Economic Benefit Analysis*, prepared for the U.S. Environmental Protection Agency, by RCG/Hagler, Bailly, Inc., January 1990

The third study, completed in 1991 for the facility's owners, showed a result of 2-50 *cents* per household, a minuscule fraction of the first study's finding, and at the low end, a tiny fraction of the second study's finding. This third study, in providing information to respondents, noted that: (1) the WTP would be for actions to reduce haze, with no benefits for human health, wildlife, vegetation, or geological features; (2) the WTP would be for actions to provide benefits for only a few days per year; (3) the weather adversely affected visibility much more frequently than the generating station's haze; (4) since NGS is likely to operate for 20 years, both the problem and the improvements are temporary. Using photos to represent "current" and "improved" conditions for all 365 days of the year, where visibility improvements were sometimes obscured by the naturally occurring cloudy and overcast weather, the study asked respondents to rank five hypothetical visibility improvement programs, some of which corresponded to the expected results of additional controls on the Navajo Generating Station, and then asked which of the programs they would be willing to pay something for each year. It got a high percentage of zero WTP values, from as many as 90% of the respondents for one of the hypothetical programs. Even for the program providing the highest benefits (more than predicted with additional controls at the facility), 40% of the respondents indicated a zero WTP.

This issue was finally settled in a negotiated agreement between EPA and the plant owners. However, the Navajo Generating Station studies illustrate how CVM results can vary depending upon how questions are asked and how the results are analyzed.

APPENDIX V

VESSELS IN U.S. TRADES
3Q 1989 AND 3Q 1991

VESSELS OPERATING IN U.S. TRADES

(By Size, by Region, by Flag Type, by OPA Retirement Period)

Vessel Size Range, 000 GRT	5-14.9	15-29.9	30+	Total	5-14.9	15-29.9	30+	Total
	---------Third Quarter 1991---------				---------Third Quarter 1989---------			
Region/flag/OPA retirement	(in 000 DWT, unless noted)				(in 000 DWT, unless noted)			
EAST COAST								
Flag of Convenience								
1995	0.0	60.6	0.0	60.6	0.0	30.3	73.1	103.4
96-2000	0.0	0.0	3653.3	3653.3	19.5	0.0	4684.3	4703.8
2001-05	82.1	498.6	1828.8	2409.5	94.6	1225.5	2179.8	3499.9
2006+	40.6	1824.4	3917.1	5782.1	68.8	1475.4	2502.2	4046.4
Total DWT	**122.8**	**2382.7**	**9399.1**	**11905.5**	**182.9**	**2731.2**	**9439.4**	**12353.5**
Total No. of Vessels	**7**	**63**	**92**	**162**	**9**	**73**	**96**	**178**
Other Privately-Owned								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	19.5	28.9	2173.0	2221.5	0.0	25.2	2095.8	2121.0
2001-05	0.0	420.5	746.6	1167.1	21.5	1294.1	1266.5	2582.1
2006+	42.7	943.2	1332.2	2318.0	20.0	1329.8	1387.2	2737.0
Total DWT	**62.2**	**1392.6**	**4251.8**	**5706.6**	**41.5**	**2649.1**	**3749.5**	**7440.1**
Total No. of Vessels	**3**	**35**	**42**	**80**	**2**	**69**	**48**	**119**
Nat'l Gov't								
1995	0.0	0.0	0.0	0.0	0.0	0.0	275.4	275.4
96-2000	0.0	0.0	126.1	126.1	15.8	0.0	0.0	15.8
2001-05	0.0	0.0	0.0	0.0	0.0	96.6	304.9	401.5
2006+	15.8	178.7	63.0	257.5	0.0	0.0	150.5	150.5
Total DWT	**15.8**	**178.7**	**189.1**	**383.5**	**15.8**	**96.6**	**730.8**	**843.2**
Total No. of Vessels	**1**	**5**	**2**	**8**	**1**	**3**	**7**	**11**
U.S.								
1995	0.0	95.3	70.4	165.7	0.0	63.1	70.4	133.5
96-2000	0.0	820.1	276.0	1096.2	0.0	625.6	186.1	811.7
2001-05	0.0	274.4	101.7	376.1	0.0	306.4	101.8	408.2
2006+	0.0	204.0	97.6	301.6	0.0	190.0	0.0	190.0
Total DWT	**0.0**	**1393.8**	**545.8**	**1939.6**	**0.0**	**1185.1**	**358.3**	**1543.4**
Total No. of Vessels	**0**	**39**	**8**	**47**	**0**	**31**	**5**	**36**
TOTAL								
1995	0.0	156.0	70.4	226.4	0.0	93.4	418.9	512.3
96-2000	19.5	849.1	6228.4	7097.0	35.3	650.8	6966.2	7652.3
2001-05	82.1	1193.5	2677.1	3952.8	116.1	2922.6	3853.0	6891.7
06-2010	99.1	3150.2	5409.9	8659.2	88.8	2995.2	4039.9	7123.9
Total DWT	**200.7**	**5348.8**	**14385.8**	**19935.3**	**240.2**	**6662.0**	**15278.0**	**22180.2**
Total No. of Vessels	**11**	**142**	**144**	**297**	**12**	**176**	**156**	**344**

Source: Lloyds Maritime Information Service

VESSELS OPERATING IN U.S. TRADES

(By Size, by Region, by Flag Type, by OPA Retirement Period)

Vessel Size Range, 000 GRT	5-14.9	15-29.9	30+	Total	5-14.9	15-29.9	30+	Total
	---------Third Quarter 1991---------				---------Third Quarter 1989---------			
Region/flag/OPA retirement	(in 000 DWT, unless noted)				(in 000 DWT, unless noted)			
GULF COAST								
Flag of Convenience								
1995	0.0	0.0	0.0	0.0	0.0	60.6	0.0	60.6
96-2000	20.3	0.0	4408.8	4429.1	16.3	47.2	4933.4	4996.9
2001-05	85.8	365.2	2939.4	3390.3	124.3	601.2	3170.8	3896.3
2006+	131.8	1518.2	5448.1	7098.1	86.6	1198.4	6698.1	7983.1
Total DWT	**237.9**	**1883.4**	**12796.3**	**14917.6**	**227.2**	**1907.4**	**14832.3**	**16936.9**
Total No. of Vessels	**14**	**48**	**126**	**188**	**12**	**52**	**125**	**189**
Other Privately-Owned								
1995	0.0	0.0	0.0	0.0	0.0	0.0	70.0	70.0
96-2000	19.5	26.9	1546.3	1592.7	0.0	0.0	3378.9	3378.9
2001-05	18.0	392.0	1367.4	1777.4	23.6	450.1	1049.3	1523.0
2006+	44.3	1570.2	4700.3	6314.8	19.7	1372.8	4237.3	5629.8
Total DWT	**81.8**	**1989.1**	**7614.0**	**9684.9**	**43.3**	**1822.9**	**8735.5**	**10601.7**
Total No. of Vessels	**6**	**49**	**62**	**117**	**2**	**43**	**64**	**109**
Nat'l Gov't								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	0.0	0.0	18.0	0.0	137.7	155.7
2001-05	19.4	0.0	68.0	87.3	16.5	64.2	60.6	141.3
2006+	65.1	136.1	63.0	264.3	0.0	111.2	324.7	435.9
Total DWT	**84.5**	**136.1**	**131.0**	**351.6**	**34.5**	**175.4**	**523.0**	**732.9**
Total No. of Vessels	**5**	**3**	**2**	**10**	**2**	**5**	**6**	**13**
U.S.								
1995	18.4	246.9	70.4	335.7	18.4	220.0	150.9	389.3
96-2000	0.0	1068.8	357.4	1426.2	0.0	912.9	554.8	1467.7
2001-05	0.0	539.9	101.7	641.6	0.0	572.6	485.3	1057.9
2006+	0.0	213.7	97.6	311.3	0.0	257.8	97.6	355.4
Total DWT	**18.4**	**2069.3**	**627.1**	**2714.8**	**18.4**	**1963.3**	**1288.6**	**3270.3**
Total No. of Vessels	**1**	**56**	**9**	**66**	**1**	**52**	**16**	**69**
TOTAL								
1995	18.4	246.9	70.4	335.7	18.4	280.6	220.9	519.9
96-2000	39.8	1095.7	6312.5	7448.1	34.3	960.1	9004.8	9999.2
2001-05	123.2	1297.0	4476.5	5896.6	164.4	1688.1	4766.0	6618.5
06-2010	241.2	3438.2	10309.0	13988.4	106.3	2940.2	11357.7	14404.2
Total DWT	**422.6**	**6077.9**	**21168.4**	**27668.9**	**323.4**	**5869.0**	**25349.4**	**31541.8**
Total No. of Vessels	**26**	**156**	**199**	**381**	**17**	**152**	**211**	**380**

Source: Lloyds Maritime Information Service

VESSELS OPERATING IN U.S. TRADES

(By Size, by Region, by Flag Type, by OPA Retirement Period)

Vessel Size Range, 000 GRT	Third Quarter 1991				Third Quarter 1989			
	5-14.9	15-29.9	30+	Total	5-14.9	15-29.9	30+	Total
Region/flag/OPA retirement	(in 000 DWT, unless noted)				(in 000 DWT, unless noted)			
WEST COAST								
Flag of Convenience								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	1577.9	1577.9	0.0	20.0	2595.8	2615.8
2001-05	39.7	196.4	227.5	463.5	68.1	156.4	299.6	524.1
2006+	93.2	282.9	1015.4	1391.5	64.6	197.2	785.9	1047.7
Total DWT	**132.9**	**479.3**	**2820.8**	**3433.0**	**132.7**	**373.6**	**3681.3**	**4187.6**
Total No. of Vessels	**7**	**12**	**26**	**45**	**7**	**10**	**30**	**47**
Other Privately-Owned								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	289.6	289.6	0.0	0.0	329.4	329.4
2001-05	17.3	178.2	501.6	697.1	0.0	93.2	401.8	495.0
2006+	17.2	329.5	342.6	689.3	33.9	271.5	751.6	1057.0
Total DWT	**34.6**	**507.7**	**1133.7**	**1676.0**	**33.9**	**364.7**	**1482.8**	**1881.4**
Total No. of Vessels	**2**	**12**	**17**	**31**	**2**	**9**	**10**	**21**
Nat'l Gov't								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001-05	0.0	0.0	131.1	131.1	0.0	0.0	61.6	61.6
2006+	0.0	133.8	159.1	292.9	38.3	114.6	126.0	278.9
Total DWT	**0.0**	**133.8**	**290.2**	**424.0**	**38.3**	**114.6**	**187.6**	**340.5**
Total No. of Vessels	**0**	**4**	**4**	**8**	**2**	**2**	**3**	**7**
U.S.								
1995	34.8	26.6	0.0	61.4	34.9	146.0	73.2	254.1
96-2000	0.0	512.7	2743.1	3255.7	0.0	263.3	2477.1	2740.4
2001-05	27.4	304.2	1598.1	1929.7	0.0	332.0	1389.8	1721.8
2006+	0.0	267.4	273.5	540.9	0.0	259.5	273.5	533.0
Total DWT	**62.2**	**1111.0**	**4614.6**	**5787.8**	**34.9**	**1000.8**	**4213.6**	**5249.3**
Total No. of Vessels	**3**	**29**	**38**	**70**	**2**	**27**	**30**	**59**
TOTAL								
1995	34.8	26.6	0.0	61.4	34.9	146.0	73.2	254.1
96-2000	0.0	512.7	4610.5	5123.2	0.0	283.3	5402.3	5685.6
2001-05	84.3	678.8	2458.2	3221.4	68.1	581.6	2152.8	2802.5
06-2010	110.5	1013.7	1790.6	2914.8	136.8	842.8	1937.0	2916.6
Total DWT	**229.6**	**2231.8**	**8859.4**	**11320.8**	**239.8**	**1853.7**	**9565.3**	**11658.8**
Total No. of Vessels	**12**	**57**	**85**	**154**	**13**	**48**	**73**	**134**

Source: Lloyds Maritime Information Service

VESSELS OPERATING IN U.S. TRADES

(By Size, by Region, by Flag Type, by OPA Retirement Period)

Vessel Size Range, 000 GRT	5-14.9	15-29.9	30+	Total	5-14.9	15-29.9	30+	Total
Region/flag/OPA retirement	--------Third Quarter 1991-------- (in 000 DWT, unless noted)				--------Third Quarter 1989-------- (in 000 DWT, unless noted)			
CARIBBEAN								
Flag of Convenience								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	298.3	298.3	20.3	0.0	1328.2	1348.5
2001-05	21.1	390.7	201.8	613.6	16.9	266.3	532.5	815.7
2006+	16.9	528.7	1472.0	2017.6	0.0	0.0	1609.5	1609.5
Total DWT	**38.0**	**919.3**	**1972.1**	**2929.4**	**37.2**	**266.3**	**3470.2**	**3773.7**
Total No. of Vessels	**2**	**22**	**14**	**38**	**2**	**6**	**27**	**35**
Other Privately-Owned								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	19.5	0.0	338.3	357.9	0.0	0.0	1271.4	1271.4
2001-05	0.0	117.5	527.4	644.8	0.0	234.4	1182.3	1416.7
2006+	20.0	643.6	886.6	1550.2	0.0	242.6	961.7	1204.3
Total DWT	**39.5**	**761.0**	**1752.3**	**2552.8**	**0.0**	**477.0**	**3415.4**	**3892.4**
Total No. of Vessels	**2**	**17**	**19**	**38**	**0**	**12**	**17**	**29**
Nat'l Gov't								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	0.0	0.0	0.0	0.0	174.6	174.6
2001-05	0.0	0.0	0.0	0.0	0.0	22.6	0.0	22.6
2006+	16.2	155.0	0.0	171.2	0.0	61.3	229.3	290.6
Total DWT	**16.2**	**155.0**	**0.0**	**171.3**	**0.0**	**83.9**	**403.9**	**487.8**
Total No. of Vessels	**1**	**4**	**0**	**5**	**0**	**2**	**6**	**8**
U.S.								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001-05	0.0	39.2	0.0	39.2	0.0	0.0	0.0	0.0
2006+	0.0	0.0	0.0	0.0	0.0	78.6	0.0	78.6
Total DWT	**0.0**	**39.2**	**0.0**	**39.2**	**0.0**	**78.6**	**0.0**	**78.6**
Total No. of Vessels	**0**	**1**	**0**	**1**	**0**	**2**	**0**	**2**
TOTAL								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	19.5	0.0	636.7	656.2	20.3	0.0	2774.2	2794.5
2001-05	21.1	547.4	729.2	1297.6	16.9	523.3	1714.8	2255.0
06-2010	53.1	1327.3	2358.6	3739.0	0.0	382.5	2800.5	3183.0
Total DWT	**93.7**	**1874.6**	**3724.4**	**5692.8**	**37.2**	**905.8**	**7289.5**	**8232.5**
Total No. of Vessels	**5**	**44**	**33**	**82**	**2**	**22**	**50**	**74**

Source: Lloyds Maritime Information Service

VESSELS OPERATING IN U.S. TRADES

(By Size, by Region, by Flag Type, by OPA Retirement Period)

Vessel Size Range, 000 GRT	Third Quarter 1991				Third Quarter 1989			
	5-14.9	15-29.9	30+	Total	5-14.9	15-29.9	30+	Total
Region/flag/OPA retirement	(in 000 DWT, unless noted)				(in 000 DWT, unless noted)			
LOOP								
Flag of Convenience								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	0.0	0.0	0.0	0.0	2568.3	2568.3
2001-05	0.0	0.0	0.0	0.0	0.0	48.7	401.4	450.1
2006+	0.0	0.0	9073.0	9073.0	0.0	0.0	5415.5	5415.5
Total DWT	**0.0**	**0.0**	**9073.0**	**9073.0**	**0.0**	**48.7**	**8385.2**	**8433.9**
Total No. of Vessels	**0**	**0**	**33**	**33**	**0**	**1**	**36**	**37**
Other Privately-Owned								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	0.0	0.0	0.0	0.0	1728.3	1728.3
2001-05	0.0	0.0	0.0	0.0	0.0	0.0	818.6	818.6
2006+	0.0	0.0	6709.5	6709.5	0.0	0.0	5148.3	5148.3
Total DWT	**0.0**	**0.0**	**6709.5**	**6709.5**	**0.0**	**0.0**	**7695.2**	**7695.2**
Total No. of Vessels	**0**	**0**	**20**	**20**	**0**	**0**	**25**	**25**
Nat'l Gov't								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001-05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2006+	0.0	0.0	0.0	0.0	0.0	0.0	155.2	155.2
Total DWT	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**155.2**	**155.2**
Total No. of Vessels	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**
U.S.								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	0.0	0.0	0.0	0.0	183.8	183.8
2001-05	0.0	0.0	0.0	0.0	0.0	0.0	247.9	247.9
2006+	0.0	0.0	91.8	91.8	0.0	0.0	0.0	0.0
Total DWT	**0.0**	**0.0**	**91.8**	**91.8**	**0.0**	**0.0**	**431.7**	**431.7**
Total No. of Vessels	**0**	**0**	**1**	**1**	**0**	**0**	**4**	**4**
TOTAL								
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96-2000	0.0	0.0	0.0	0.0	0.0	0.0	4480.4	4480.4
2001-05	0.0	0.0	0.0	0.0	0.0	48.7	1467.9	1516.6
06-2010	0.0	0.0	15874.3	15874.3	0.0	0.0	10719.0	10719.0
Total DWT	**0.0**	**0.0**	**15874.3**	**15874.3**	**0.0**	**48.7**	**16667.3**	**16716.0**
Total No. of Vessels	**0**	**0**	**54**	**54**	**0**	**1**	**66**	**67**

Source: Lloyds Maritime Information Service

VESSELS OPERATING IN U.S. TRADES

(By Size, by Region, by Flag Type, by OPA Retirement Period)

Vessel Size Range, 000 GRT	Third Quarter 1991				Third Quarter 1989			
	5-14.9	15-29.9	30+	Total	5-14.9	15-29.9	30+	Total
Region/flag/OPA retirement	(in 000 DWT, unless noted)				(in 000 DWT, unless noted)			
TOTAL VESSELS IN U.S. TRADES								
Flag of Convenience								
1995	0.0	60.6	0.0	60.6	0.0	60.6	73.1	133.7
96-2000	20.3	0.0	8462.5	8482.8	56.1	67.2	14219.9	14343.2
2001-05	165.6	983.7	3773.6	4922.8	237.7	1576.1	4957.5	6771.3
2006+	286.5	2726.0	17851.1	20863.6	180.0	2212.5	12606.2	14998.7
Total DWT	**472.4**	**3770.3**	**30087.2**	**34329.9**	**473.8**	**3916.4**	**31856.7**	**36246.9**
Total No. of Vessels	**27**	**99**	**229**	**355**	**25**	**104**	**244**	**373**
Other Privately-Owned								
1995	0.0	0.0	0.0	0.0	0.0	0.0	70.0	70.0
96-2000	19.5	55.9	3358.5	3433.9	0.0	25.2	6393.6	6418.8
2001-05	35.3	818.2	2337.0	3190.5	45.1	1694.8	3721.8	5461.7
2006+	104.2	2389.0	11379.9	13873.1	73.6	2329.2	11547.0	13949.8
Total DWT	**159.0**	**3263.0**	**17075.4**	**20497.4**	**118.7**	**4049.2**	**21732.4**	**25900.3**
Total No. of Vessels	**10**	**81**	**117**	**208**	**6**	**102**	**132**	**240**
Nat'l Gov't								
1995	0.0	0.0	0.0	0.0	0.0	0.0	275.4	275.4
96-2000	0.0	0.0	126.1	126.1	33.8	55.8	137.7	227.3
2001-05	19.4	0.0	131.1	150.4	16.5	286.9	427.1	730.5
2006+	81.3	439.0	222.1	742.4	38.3	235.6	542.9	816.8
Total DWT	**100.7**	**439.1**	**479.3**	**1019.1**	**88.6**	**578.3**	**1383.1**	**2050.0**
Total No. of Vessels	**6**	**12**	**6**	**24**	**5**	**14**	**14**	**33**
U.S.								
1995	34.8	246.9	70.4	352.2	34.9	339.4	224.1	598.4
96-2000	0.0	1487.8	3283.7	4771.5	0.0	1323.1	3031.9	4355.0
2001-05	27.4	828.2	1598.1	2453.6	0.0	850.7	1783.1	2633.8
2006+	0.0	426.4	371.1	797.6	0.0	693.5	273.5	967.0
Total DWT	**62.2**	**2989.3**	**5323.3**	**8374.8**	**34.9**	**3206.7**	**5312.6**	**8554.2**
Total No. of Vessels	**3**	**80**	**47**	**130**	**2**	**84**	**43**	**129**
TOTAL								
1995	34.8	307.6	70.4	412.8	34.9	400.0	642.6	1077.5
96-2000	39.8	1543.6	15230.8	16814.2	89.9	1471.3	23783.1	25344.3
2001-05	247.6	2630.0	7839.7	10717.4	299.3	4408.5	10889.5	15597.3
06-2010	472.0	5980.5	29824.2	36276.7	291.9	5470.8	24969.6	30732.3
Total DWT	**794.3**	**10461.7**	**52965.2**	**64221.2**	**716.8**	**11750.6**	**60284.**	**72751.4**
Total No. of Vessels	**46**	**272**	**399**	**717**	**38**	**304**	**433**	**775**

Source: Lloyds Maritime Information Service

Regional detail does not add to U.S. total; vessels counted once in totals, but may have called in several regions.

END

DATE FILMED

9/1/92