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The Tanker and Ocean Oil Pollution

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INTRODUCTION

Since the beginning of human history, the world's oceans have generally been regarded as inexhaustible in all their resources, including the extent to which they are able to assimilate the wastes of mankind. However, evidence is accumulating rapidly that effectively disproves this long held theory. Today, pollution is detectably undermining the health of the marine environment, and the root cause can be traced to man's activities in an increasingly industrialized and urbanized society. It is now clear that the capacity of the oceans to accept some of the by-products of civilization is limited. The oceans can no longer be the world's sink, if we are to maintain the ecological viability of the biosphere (1).

The dangers of the present situation are compounded by the difficulties in defining "marine pollution". The definition currently accepted by the United Nations specialized agencies and their advisory experts is as follows:

> "Introduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazard

to human health, hindrance to marine activities including fishing, impairment of quality for use of sea water, and reduction of amenities"(2).

Today's concern with pollution and its effects upon our way of life requires that the impact of ships on the marine environment be considered in order to minimize the risk that waterborne cargoes, particularly petroleum products, present to the ecology.

The two questions which follow need to be resolved as soon as possible in order to provide a perspective and at least a partial solution to the problem of oil pollution of the ocean environment.

1. Perspective: What are the sources, magnitudes, and ecological effects of oil pollution of the marine environment?

2. Solution: What improvements can be made to the oil tanker transportation system in order to minimize the oil pollution hazard to the oceans of the world?

PERSPECTIVE

GLOBAL ECOLOGY

Ecology is that branch of biology which deals with the mutual relationships between organisms and the environment in which they live. The world's oceans, 140 million square miles of water covering over 70 percent of the earth's surface, are absolutely essential to maintaining, preserving, and protecting that environment. The oceans contribute to the oxygen - carbon dioxide balance in the atmosphere and they have a profound effect on global climatic and weather conditions. They also provide the base for the world's hydrologic system which includes the life support media for marine life - a major source of protein to man. The needs and demands of today's modern society have imposed tremendous pressures and stresses on the environment. While the marine environment is tolerant of many isolated individual actions, and even of occasionally large collective stresses, this delicately balanced system - the ecosystem upon which the human race relies for its very existence - may not be capable of absorbing the summation of all these stresses over an extended period of time.

MARINE TRANSPORTATION OF OIL

Oil pollution is a direct consequence of the dependence of a growing world population upon a petroleum-based technology. Three quarters or more of all the power consumed by the world comes from oil or its related petroleum resource, natural gas. Between 1938 and 1970 the world's production of oil increased by a factor greater than seven, from 278 million metric tons to 1 billion, 970 million metric tons per year (3). In 1970, an estimated 1 billion, 300 million metric tons out of a possible 1 billion, 970 million metric tons of the world's annual oil production total were being transported in tank ships at sea (4). It is projected that this figure will more than double by the end of this decade, rising to approximately 2 billion, 700 million metric tons per year (Fig. 1). (It is recognized that this projection will be affected in an as yet undetermined degree by the recent and ongoing developments regarding Middle East oil production and pricing). Nevertheless, the concrete prospect of greatly increased marine carriage of petroleum, in combination with the rapidly increasing size of tankers and the overall increase in the density of waterborne traffic, strongly suggests advance planning and intensive management in order to prevent or at the very least minimize the occurrence of oil spillage incidents within the marine environment.

MARINE POLLUTION

The ocean environment has already been seriously damaged as a result of marine pollution. Shellfish have been found to contain a variety of pathogens or disease causing organisms, and a portion of the world's commercial shellfish beds have been declared contaminated because of pollution. Beaches, bays, harbors, and estuaries have been closed off to bathers and other recreational users, lifeless, unproductive zones have been created in the marine environment, and there have been massive kills of finfish and other organisms. It is becoming increasingly obvious to those who undertake investigation into the ecology of the oceans that identifiable portions of the marine eco-system are being profoundly and irreversibly altered, and that in most instances these changes result in the development of undesirable situations having very far-reaching and unintended side effects.

OIL POLLUTION

Oil, though the most visible and highly publicized of marine contaminants, traditionally has been considered by the scientific community to have little harmful effect on the marine eco-system. As late as their 1971

meeting in Rome, the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) concluded that a single heavy contamination of the flora and fauna of the intertidal zone has a negligible effect on marine life (6). Most studies of oil spills rely on subjective visual measurements or else on statistical analyses of adult fish. This has led to the belief that spills do little biological, long lasting damage to the ocean environment. Since oil spills do seem to visibly disappear after a short period of time, many individuals in the scientific community have prematurely and erroneously concluded that a combination of evaporation and biological degradation of the oil rids the water of contamination after a relatively short time period.

More recent, sophisticated studies have effectively disproven this contention. At the Woods Hole Oceanographic Institution an inter-disciplinary group of scientists has undertaken the study over a period of almost four years of a small oil spill that took place in Buzzards Bay, Massachusetts. Studying not only adult fishes but also the sub-tidal organisms that inhabit the marine sediments and cannot remove themselves from the immediate area of contamination, the group established three important findings (7):

1. The oil persisted in the environment far longer than had been thought possible.

2. Oil continued to spread over the ocean floor months after the accident.

3. The toxic effects on a wide variety of marine life forms continued for months and even years.

The immediate kill in the heavily affected area of Buzzards Bay was virtually complete. Some 95 percent of the fish, crabs, lobsters, clams, and other invertebrates were dead within hours of the accident. What was unexpected was the degree of spreading of the oil in the sediments beneath the surface. Immediately after the spillage incident, a control station was initiated beyond the area of expected heavy contamination. Within three weeks oil was discovered at this location, along with a substantial volume of dead marine organisms. A second control station twice as far removed was then established and it also was overtaken by the oil spreading along the floor of the ocean, with still another kill of bottom living animals. Eight months after the spill, the polluted offshore region had grown to ten times the area initially affected, eventually covering 22 square kilo-

meters of offshore water, tidal river, and marsh.

Thus, although shortly after the accident the area returned visually to its former state of natural beauty, chemically and biologically the ill effects of the oil spill still were present over a large area of the shoreline. An entire year of evaporation and bacterial action on the oil did not remove many of its most highly toxic components. Juvenile blue mussels that were affected by the oil spill in 1969 were found to be sterile in 1970. Oysters that had been contaminated by the oil were maintained in clean, running sea water for six months, yet a substantial residual component of oil remained in their tissues at the end of that period. All in all, the scientific evidence added up to a far more incriminating picture of the problems of oil than had been previously envisioned.

Unfortunately, the problem threatens to get worse, not better. Already signs are evident that certain types of contamination are becoming global in scope. Golf ball sized balls of tar, formed from the heavier, more viscous components of oil, have been discovered in massive proportions throughout the Atlantic Ocean, affecting some 665 thousand square miles of surface water. In the summer of 1972, widely scattered research vessels on duty between Cape Cod and the Caribbean repeatedly found

their plankton nets fouled by thick clumps of oil (8). Half the plankton samples gathered from surface areas were found to be contaminated with oil. While it is as yet unclear whether tar balls and clumps of oil will have severe and harmful long lasting effects on the marine environment, their presence in large concentrations throughout vast tracts of ocean indicates, if nothing else, that some forms of pollution and contamination are far from localized problems.

ECOLOGICAL EFFECTS OF OIL POLLUTION

The ecological impact of an oil spill can run the entire spectrum of maximal to minimal depending on such factors as the species contaminated, the amount and rate of oil spillage, local tide, wind, and current conditions, and the toxicity, solubility, biodegradability, volatility, and density of the oil. Oil may damage or kill fish and invertebrates in a number of ways. It can directly kill them by coating their epithelial surfaces, by contact poisoning due to small concentrations of the highly toxic hydrocarbons present in petroleum, and by exposure to water soluble toxic components of oil at some time and distance from the oil spill.(9). Other nonlethal effects of oil on fish or shellfish include the tainting of their flesh, which renders them unfit or un-

desirable for human consumption, physical fouling, and repellent effects which may influence the breeding behavior and propagation of the species.

The effects of oil on waterfowl are easy to observe and waterfowl probably are the most affected species. They seem irresistibly attracted to oil slicks, either through their normal feeding behavior or the characteristic vapor of the oil. They subsequently dive into the oil slick and their feathers become oil soaked. Waterfowl exposed to oil in this manner have a probability of survival which is quite small, eventually perishing due to exhaustion, starvation, and exposure.

Oil, if present in sufficient quantities over an extended period of time, is toxic to aquatic plants. It is suspected that one of the low level, long term effects upon the marine eco-system is damage to the microscopic marine plants (9). Free oil and emulsions are capable of coating and destroying algae. The coated organisms may then agglomerate with suspended solids and settle to the ocean floor. An eventual oily coating on the sea floor will destroy bottom dwelling forms and displace and disrupt spawning areas and activities.

Many other animals and organisms inhabit the marine environment, playing an essential part in nutrient cycles and food chains. An example of an oil spill being the

causative agent of widespread destruction of bethnic fauna has already been referred to (7). Oil brings about a change in the composition and balance of the bacteria present in sea water so that bacterial forms using petroleum or any of its derivitives will predominate. The question of whether this is beneficial or harmful to the marine environment is difficult to decide except to note that it does offset a long standing ecological equilibrium.

There are other effects of oil on the marine environment which are generally applicable to all forms of aquatic life. For instance, the exposure of organisms to sub-lethal amounts of oil results in their reduced resistance to infections and other stresses. Apart from the particular reaction of any given species to a given amount of a specific oil, there will usually be more extensive destruction of the generally more sensitive and fragile juvenile forms of that species due to the presence of the oil. Heavy coatings of free oil on the surface of the water interfere with the natural processes of re-aeration and photosynthesis. There has not been, however, any significant environmental effect measured to date on the exchange of oxygen and carbon dioxide between the ocean and the atmosphere (10).

SOURCES OF OIL POLLUTION

To give a meaningful perspective to the impact of tankers on the ecology, it is necessary to resolve the sources and magnitudes of oil pollution to the seas. A recurring statement in much of the earlier pollution literature was that the most significant source of oil which pollutes the seas had its origin in ships, tankers being the single largest source of oil pollution within this category. In recent years, it has become widely held that the major sources of ocean pollution are land based and not ship-borne, upwards of 90 percent of the oil in the ocean environment now being considered to have reached the sea by hydrocarbon fallout through the vaporization of petroleum products such as diesel oils and gasolines (11).

Approximate percentages by source of the estimated oil pollution of the oceans are given in Table 1. These percentages do not include oil contributed by the natural seepage of underground petroleum deposits. This information reminds us that the dramatic accident is often a relatively minor contributor to the total of oil pollution when compared to the amounts contributed by routine day by day operations.

Table 1 gives a clearer insight into the problem

of allocating oil pollution abatement resources. According to this data, oceangoing vessels account for a very minor percentage of all the oil finding its way into the oceans. Considering the many different oil pollution contributors and the variety of solutions possibly applicable to each, selection of the remedies to be actually adopted becomes difficult and controversial. The remedies for eliminating ship oily discharges may be ineffectual in coping with the overall problem unless a similar objective is attained for cutting off the land generated discharges. It is ironic that the Law of the Sea Conference just getting underway will undoubtedly not consider land generated pollution of the ocean beyond the territorial sea. Nevertheless, the serious threat which oil pollution poses to the world's sensitive life support system mandates that each and every feasible method to reduce contamination of the water by oil be implemented without delay.

The projections of the increased amounts of oil to be carried by sea in the future (Fig. 1) indicate that the attack on the pollution problem must be accelerated if we are to minimize serious environmental damages. Present efforts should be intensified so that better long range solutions can be obtained. The long term, low level effects of oil pollution may be more serious and

persistent than the obvious short term effects. These unknown relationships concerning the lasting impact of oil on marine biology deserve further intensive investigation, for it is an inescapable fact that the ecological future of this planet will always be tied to the oceans.

SOLUTION

NATIONAL PLAN OF ACTION

The United States anti-oil spill program stemmed from the original U.S. position expressed by Secretary of Transportation Volpe at the start of the Colloquium on Oil Spills sponsored by the NATO Committee on Challenges of Modern Society (NATO/CCMS) held in Brussels in November, 1970 (12). This program, exemplifying the growing concern about the effects of oil pollution on the marine environment and the desire to alleviate the situation, envisaged a "zero discharge" concept of completely eliminating all intentional discharges of oil by mid-decade. The NATO/CCMS Conference Resolution, as finally approved and adopted, fell short of the original U.S. position, but called for work to begin at once to achieve by 1975, if possible, but not later than the end of the decade, the elimination of intentional discharges of oil and oily wastes.

A number of top level meetings, bringing together the leading members of government and industry, were initiated by the White House and the Council on Environmental Quality (CEQ) to implement the U.S. ocean oil pollution abatement policy. A task group was formed to work in

collaboration with the American Institute of Merchant Shipping (AIMS) for the purpose of initiating a program to achieve the U.S. anti-oil spill goal. The project was undertaken by an ad hoc subcommittee of the AIMS Tanker Council, and a report was completed and submitted to CEQ, highlighting three approaches to the problem of oily discharges from ships, namely: the Load-on-Top procedure for decanting oily ballast water, port facilities for reception and treatment of oily ballast water, and segregated ballast tanker design (13). It might be appropriate at this point to describe briefly the meaning of segregated ballast design and the Load-on-Top method:

> Segregated Ballast - By providing separate ballast tanks that are used exclusively for clean ballast water, the ballasting operation for tankers can eliminate the mixing of oil and water which results in the oily discharge problem. There are a number of ways of providing segregated ballast capacity, including double bottoms, double hulls, as well as conventional wing tanks. One method would be to utilize the conventional wing tanks of a ship designed to be somewhat deeper than normal in order to recover the cargo volume lost due to the greater amount of ballast capacity. A typical arrangement

for this alternative is shown in Figure 2. Most conventional tankers have one or two tanks dedicated to segregated ballast, however, for certain voyages and under severe weather conditions additional ballast must be taken on in the cargo tanks. A segregated ballast tanker is designed to have sufficient capacity for all sea conditions, thus eliminating the need to take on additional ballast in the cargo tanks.

Load-on-Top Method - Recognizing that the intentional pollution resulting from the uncontrolled discharge to the sea of oily ballast water and tank washings represented a major source of ship related oil discharges, the oil companies instituted a ballasting procedure referred to as Load-on-Top (LOT). When employing this method, tankers on their return ballast voyage take on sea water in several of the cargo tanks in sufficient quantity to maintain the required stability condition, while the remaining empty cargo tanks are washed down. All the tank washings are then pumped out of the cleaned tanks and transferred to the slop tank. Fresh sea water is pumped into the washed tanks, which now contain clean ballast water. At the same time, the oily

sea water in the cargo tanks which were used for ballasting is permitted to stand until the oil residue in the tanks has gravitated to the top. The decanted water in these tanks is now discharged overboard until the oil-water interface is reached. The oily slops from the dirty ballast tanks are then pumped to the slop tank. At this point, the oil in the slops is given time to separate from the water by gravitating to the top. The decanted water under the oil in the slop tank is carefully pumped into the sea. Upon arrival at the loading port, the clean ballast water is discharged and only oil in the slop tank remains. The new cargo is then taken on board, and is loaded "on top" of the remaining oil in the slop tank.

In effect, the United States anti-oil spill policy expressed at the 1970 NATO/CCMS Conference and the subsequent discussions with industry (AIMS) and government (CEQ) representatives laid the foundation for the goals set by IMCO for the 1973 Conference on Marine Pollution.

NATIONAL STATUTES AND REGULATIONS

In the Water Quality Improvement Act of 1970, the Congress declared that it is the policy of the United

States that there should be no discharge of oil into or upon the navigable waters of the United States, adjoining shorelines, or into or upon the waters of the contiguous zone. Under this act the Environmental Protection Agency (EPA) has the authority to set standards limiting the discharge of oil in U.S. navigable waters, adjoining shorelines, and the contiguous zone. The EPA Standard for the Discharge of Oil from Vessels for the first time prohibited discharges of oil in quantities harmful to the public health and welfare as being those which (a) violate applicable water quality standards or (b) cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines(14).

The Federal Water Pollution Control Act Amendments of 1972 contained the following significant national goals relating to the marine environment:

1. The discharge of pollutants into the navigable waters of the U.S. be eliminated by 1985.

2. Wherever attainable, an interim goal of water quality which provides for protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on water be

achieved by 1983.

3. The discharge of toxic pollutants in toxic amounts be prohibited.

4. A major research and demonstration effort be made to develop the technology necessary to eliminate the discharge of pollutants into the navigable waters of the U.S., the waters of the contiguous zone, and the oceans.

The Ports and Waterways Safety Act of 1972 provides for the establishment of comprehensive minimum standards of design, construction, and operation of tank vessels to protect the marine environment. These standards will be applicable to all vessels documented under the laws of the United States and to all vessels entering the navigable waters of the United States. In the absence of the promulgation of rules and regulations consonant with international treaty, convention, or agreement in this regard, the Secretary of Transportation has the authority to establish regulations effective not later than January 1, 1976. This Act also gives the Coast Guard the authority to establish, operate, and maintain vessel traffic services and systems for ports, harbors, and other waters subject to congested vessel

traffic. Vessel traffic systems are currently in operation in San Francisco and Puget Sound, and similar systems are under development for the Houston Ship Channel/Galveston, New York and Long Island Sound, New Orleans, and Valdez, Alaska (15).

INTERNATIONAL ACTION - FORMATION OF IMCO

In 1948 the United Nations Maritime Conference at Geneva drew up a Convention which created IMCO, the United Nations Intergovernmental Maritime Consultative Organization. The functions of the new organization were designed to include the entire field of sea transportation and were established in order to provide an effective means for cooperation among governments on the technical matters affecting international merchant shipping, with special emphasis on the safety of life at sea. The IMCO Convention required the formal approval of twenty-one states, including seven each of which possessed a merchant fleet of at least one million gross tons, before the organization could begin functioning. On March 17, 1958 the target was reached and on January 6, 1959 the first IMCO Assembly met in London.

The structure of IMCO is laid down in its Convention (16). It is composed of the Assembly, which comprises representatives of all member nations and is the sovereign

body, the Council, sixteen nations subsequently expanded to eighteen, which acts as the governing body between the biennial Assembly sessions, and the Maritime Safety Committee of fourteen nations, subsequently expanded to sixteen, which is the chief technical body of IMCO acting on matters relating to the safety of life at sea. The Committee has a number of sub-committees of a non-permanent character set up to deal with specific problems as the need arises.

1954 INTERNATIONAL CONVENTION

The first major step in preventing pollution of the sea by oil took place in April and May of 1954 when an ad hoc diplomatic conference was held in London at the invitation of the government of the United Kingdom. Forty-two countries, including all the major maritime powers, attended this conference. The resulting treaty was deposited with the government of the United Kingdom pending the establishment of IMCO(17).

Although the 1954 Convention was the first major international agreement on the control of oil pollution, the Convention was hardly "ecological" by today's standards. Most countries recognized oil as a problem only to the extent that it visibly dirtied the waters, fouled beaches, and coated birds and other marine animals. Oil's

impact on the biological productivity of marine ecosystems was largely ignored. Thus the Convention's definition of oil included only the persistent oils such as crude and residual fuel oil and did not cover the refined petroleum products.

The 1954 Convention barred oil discharges exceeding 100 parts per million within 50 miles of land from tankers and as far as practicable from land for other ships, but placed no limitation on oil discharges beyond 50 miles. It required ships to maintain oil record books to help port inspectors keep track of cargoes of petroleum. The Convention prescribed that ships be fitted with devices to separate oil and water discharged from bilges, and it also required contracting nations to provide port facilities to receive oily ballast and tank cleaning residues. Resolution 1 of this Convention called for "the complete avoidance as soon as possible of discharges of persistent oil into the sea".

1962 AMENDMENTS TO THE 1954 CONVENTION

From its inception in 1959, IMCO has exercised not only the depository functions of the 1954 Convention, but also the responsibility for collecting and disseminating technical information on oil pollution which had previously been carried out by the United Nations. One

of the first tasks of IMCO was to conduct a worldwide inquiry into the general extent of oil pollution, the availability of shore facilities for the reception of oily wastes, and the progress of research and methods of combating the pollution of the seas by oil. The results of this survey led IMCO to convene the International Conference for the Prevention of Pollution of the Seas by Oil, 1962, which amended the 1954 Convention principally by extending its application to include ships of lesser gross tonnage and by extending the zones in which the discharge of oil was prohibited (18). This objective, which called for considerable technical research with particular regard to the development of efficient oily-water separating equipment and oil content meters, led the Maritime Safety Committee of IMCO to set up in 1965 a special sub-committee on oil pollution to keep these problems under review. Later, in view of the increasing evidence of pollution of the oceans by agents other than oil, this body was designated as the Sub-committee on Marine Pollution and its terms of reference were enlarged accordingly.

TORREY CANYON

IMCO's pollution prevention activities in the early years were primarily directed towards the measures for

controlling the operational discharge of oil from ships, especially tankers, during routine tank washings and ballasting operations. In 1967, however, the grounding and subsequent break-up of the Liberian tanker Torrey Canyon off the Scilly Isles brought to light the threat of massive pollution which could result from accidental discharge of oil in the event of strandings, collisions, and other maritime accidents. Harbors and miles of beach and shoreline in Southern England were fouled by heavy crude oil from the stricken vessel (1). Thousands of birds, fish, as well as other forms of animal and plant life suffered from this accident, while valuable shore properties were coated with a thick disgusting slick. Extensive damage was done by the thousands of tons of oil that poured from the broken tanker, and complicated legal questions arose relating to the vessel's conduct, as well as to the actions of those who sought to destroy the ship once she was impaled upon the ledge. The issues that surrounded this case are not likely to be forgotten for a considerable time to come.

1969 AND 1971 IMCO LEGAL CONFERENCES

The IMCO Council recognized that the Torrey Canyon disaster presented new problems of pollution control and regulation which were essentially legal in character.

In order to deal with these problems adequately and effectively, the Council established a Legal Committee and charged it with the mandate to study and recommend action on all the legal problems brought to light by Torrey Canyon. As a result of the work accomplished by the Legal Committee, a Convention was adopted by the International Legal Conference convened by IMCO in Brussels in 1969 (19). The Conference noted that, although it established the principle of strict liability and provided for a system of compulsory insurance or other financial guarantee for ships carrying oil in bulk as cargo, it did not afford full protection for victims in all cases. A special working group was appointed to consider the various aspects with regard to the establishment, organization, and administration of an international compensation fund for damages resulting from oil pollution. This working group produced a report containing conclusions and recommendations which laid the groundwork for the eventual adoption of the "Fund" Convention by a second International Legal Conference convened by IMCO in Brussels in 1971(20).

1969 AMENDMENTS TO THE 1954 CONVENTION

Another conference was held in London in 1969, in the aftermath of the Torrey Canyon incident. In October

1969, the IMCO Assembly approved further extensive amendments to the 1954 Oil Pollution Convention adopted at this conference which, apart from certain practical exemptions, were based on the principle of total prohibition of oil discharge (21). The restrictions to be applied included:

1. Prohibition of discharge of any oil whatsoever from the cargo spaces of a tanker within fifty miles of the nearest land.

2. Outside the prohibited zone, the total quantity of oil which a tanker may discharge in any ballast voyage was restricted to 1/15,000 of the total cargo carrying capacity of the vessel.

3. The instantaneous rate at which oil may be discharged was limited to a maximum of 60 litres per mile while the ship is enroute.

4. A new form of oil record book was formulated which facilitated the task of the officials concerned with enforcing these new provisions of the 1969 Amendments.

1971 AMENDMENTS TO THE 1954 CONVENTION

Recognizing the urgent need for minimizing the

amount of oil which could escape as a result of maritime accidents, particularly those involving very large tankers, the IMCO Assembly in 1971 adopted further amendments to the 1954 Oil Pollution Convention which contained requirements for tank arrangements and limitations of tank sizes in large tankers in order to control the amount of oil lost to the sea as the result of a grounding or collision(22). Except for the implementation date, these oil outflow limitations and requirements for tank arrangements and tank sizes were incorporated without change in the 1973 Marine Pollution Convention.

1973 CONFERENCE ON MARINE POLLUTION

The goal of the 1973 IMCO Conference on Marine Pollution - the complete elimination of intentional pollution of the marine environment by oil and other harmful substances and the minimization of accidental discharges of such substances - was first set by the 1962 IMCO Conference (18), which adopted certain resolutions aimed at achieving the total prohibition of oil discharge as soon as possible. However, it was not until the IMCO Assembly of 1969 that a firm decision was made to convene, in 1973, an International Conference on Marine Pollution for the purpose of preparing

a suitable international agreement for placing restraints on the contamination of the sea, land, and air by ships, vessels, and other equipment operating in the marine environment.

At its Assembly session in 1971, IMCO further decided (22) to adopt the NATO/CCMS resolution that:

> "The conference should have as its main objective the achievement by 1975, if possible, but certainly by the end of the decade, of the complete elimination of the willful and intentional pollution of the sea by oil and noxious substances other than oil, and the minimization of accidental spills".

The United States anti-oil spill policy (12), as modified by NATO/CCMS, thus was formally adopted by IMCO as the goal of the 1973 Marine Pollution Conference. The Conference, attended by 665 delegates from 79 countries, was held in London from October 8 to November 2, 1973 and concluded its deliberations with the adoption of the 1973 Marine Pollution Convention (23). Highlights of the Convention are as follows:

1. For the first time, the discharge into the marine environment of light refined oil products will be controlled by international

standards and will be subjected to at least the same operational discharge requirements imposed on crude oils and persistent petroleum products.

2. The oil discharge standards are basically those prescribed in the 1969 Amendments to the 1954 Oil Pollution Convention (21) and have been retained without substantial change. The 60 litres per nautical mile of instantaneous discharge was retained for all oil tankers, as well as the complete prohibition of all oily discharges within 50 miles from land, except that clean ballast, defined as an effluent having an oil content not exceeding 15 parts per million, may be discharged within the 50 mile zone.

3. All tankers will be required to be capable of operating with the method of Load-on-Top (LOT) or shall retain the oily wastes on board for discharge to reception facilities. To this end, all new and existing oil tankers will be required to be fitted with an automatic oil discharge monitoring and control system, oily water separating equipment or filtering system, slop tanks, sludge tanks, and piping and pumping arrangements for discharge to reception facilities.

This requirement applies to new tankers on the date of entry into force of the Convention and for existing tankers, three years after this date.

4. All new oil tankers of 70,000 tons deadweight and above, contracted for on or after January 1, 1976, or delivered on or after January 1, 1980 will be required to be fitted with segregated ballast tanks sufficient in capacity to provide adequate operating draft without the need to carry ballast water in the cargo tanks.

5. The government of each party to the Convention undertakes to insure the provision of reception facilities for oily wastes at oil loading terminals, repair ports, and in other ports in which ships have oily residues to discharge. These reception facilities must be made available no later than one year from the date of entry into force of the Convention, or by January 1, 1977, whichever occurs later.

6. The Convention designated five areas: the Mediterranean Sea, Black Sea, Baltic Sea, Red Sea, and the Persian Gulf as special areas where oil

discharge is completely prohibited. Moreover, all the littoral states within these areas must ensure that reception facilities be installed at all oil loading and repair ports within the special areas.

7. Other provisions of the Convention relate to the prevention of pollution by sewage and garbage from ships. For the former, ships will not be permitted to discharge sewage within four miles of land unless they have in operation an approved sewage treatment plant. Between four and twelve miles from land, sewage must be comminuted and disinfected before discharge. For the latter, specific minimum distances from land have been set for the disposal of all the principal kinds of garbage. The disposal of all plastics is prohibited.

8. The 1973 Convention will enter into force twelve months after it has been ratified by not less than fifteen states, the combined merchant fleets of which constitute not less than fifty percent of the gross tonnage of the world's merchant shipping. Upon its entry into force, the present Convention will supersede the 1954 International

Convention for the Prevention of Pollution of the Seas by Oil.

Table 2 shows the comparison of certain major features of the 1954 Convention, as amended in 1962, with the new 1973 Convention.

IMCO RECOMMENDATIONS FOR FUTURE ACTION

In responding to the mandates and goals established in the 1973 Convention, the following recommendations for achieving minimization of accidental oil spills (24) highlight those areas where additional work has been directed to the IMCO technical committees on a matter of high priority in order to reach the objectives of the 1973 Convention:

1. Prevention of accidents to ships by (a) development of safe navigational procedures and traffic separation schemes for the prevention of collisions, strandings, and groundings to include the ultimate development of international standards for navigational aids, and (b) development of improved maneuverability and controllability of large ships.

2. Minimization of the risk of escape of oil in the

event of maritime accidents by (a) development of pumping and piping equipment to facilitate the transfer of cargo in the event of an accident, and (b) development of transfer procedures to remove oil from breached tanks.

1974 LAW OF THE SEA CONFERENCE

In 1970 the United Nations General Assembly called for a Conference on the Law of the Sea, to stabilize international rules with respect to national rights in the oceans, particularly with respect to the territorial jurisdictions of coastal states and the establishment of an international regime to govern the exploration and exploitation of the sea beds beyond the limits of national jurisdiction. The Conference began with an organizational session in New York in December, 1973. Substantive negotiations are scheduled to be held during the summer of 1974 in Caracus, Venezuela. Related issues on marine pollution and protection of the marine environment with regard to coastal state rights of enforcement and the implementation of control standards for pollution resulting from the exploration and exploitation of the sea beds will be addressed at the Law of the Sea Conference.

The 1973 International Convention on Marine Pollution,

which now forms part of the Law of the Sea, will be forwarded to the LOS Conference for its consideration. The issues relating to the jurisdiction and powers of port states, coastal states, and maritime states will be a subject for debate at the forthcoming Conference. While each party to the 1973 Pollution Convention is required to prohibit and punish violations within its jurisdiction, or refer them to the flag state for prosecution, the IMCO Conference intentionally avoided any attempt at the resolution of jurisdictional questions.

The 1973 Pollution Convention does not contain any provision, positive or negative, regarding the rights of states to establish more stringent pollution standards within their own jurisdictions, nor do any of the Convention's regulations cover the release of harmful substances directly arising from the exploration, exploitation, and associated offshore processing of sea bed mineral resources. Pollution arising directly from offshore processing of sea bed mineral resources, along with the unresolved jurisdictional issues, will undoubtedly be the subject of detailed discussion at the 1974 Law of the Sea Conference.

CONCLUSIONS

The oceans, in contrast to the land masses of the earth, are truly international. No nation exercises sovereignty over them, and no nation acting unilaterally can protect them from pollution and other environmental insults. It is by now obvious to all that oil pollution of the marine environment must be dealt with on an international level by governments and a responsible petroleum industry.

Major strides have been made towards achieving the goals of elimination of intentional pollution by ships and the minimization of accidental pollution before the end of the decade, with particular reference to the results of the 1973 IMCO Marine Pollution Conference. The major provisions of the 1973 Pollution Convention, such as the single,broad definition of oil, mandatory segregated ballast, mandatory monitoring and control of effluents, and the regulation of discharges of harmful substances other than oil, will undoubtedly be implemented nationally by means of U.S. Coast Guard rules and regulations issued under the Ports and Waterways Safety Act of 1972 (25).

Continued effort at the international level is the primary means by which action can be taken to preserve

and enhance the marine environment. The 1973 IMCO Marine Pollution Conference and the 1974 Law of the Sea Conference have clearly indicated the growing universal concern that no nation can deal effectively with the world's ocean environment on its own. Since pollution is now recognized as a problem of global scope and magnitude, we must continue to lend appropriate support to multilateral actions designed to maintain and improve the quality of mankind's marine environment.

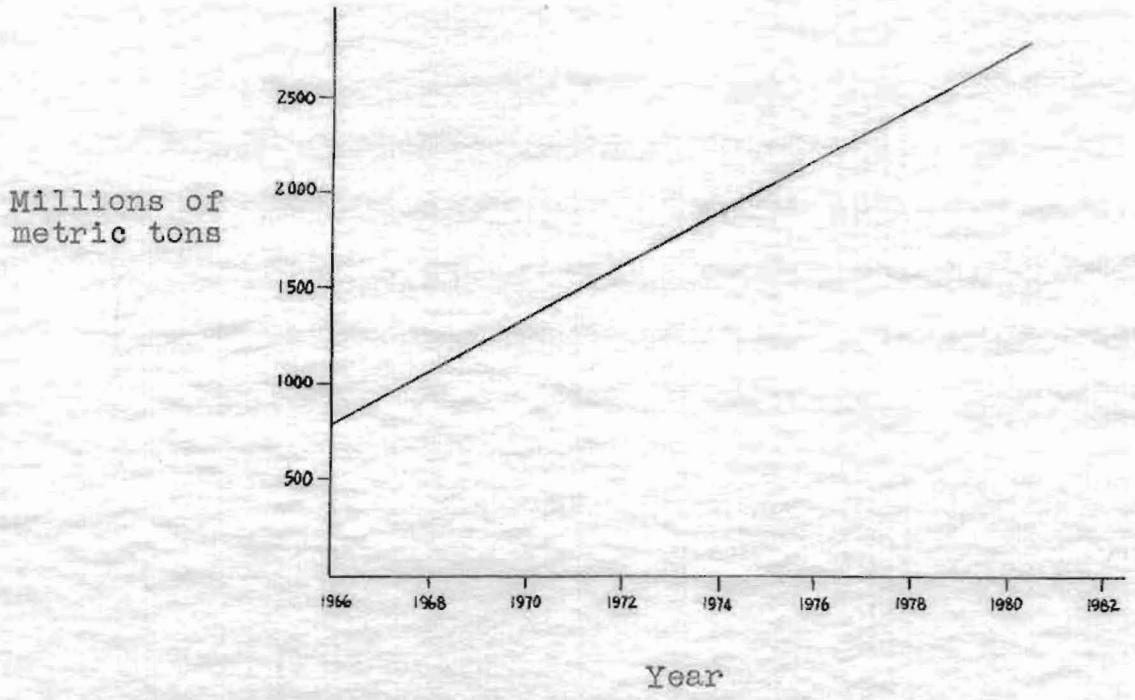
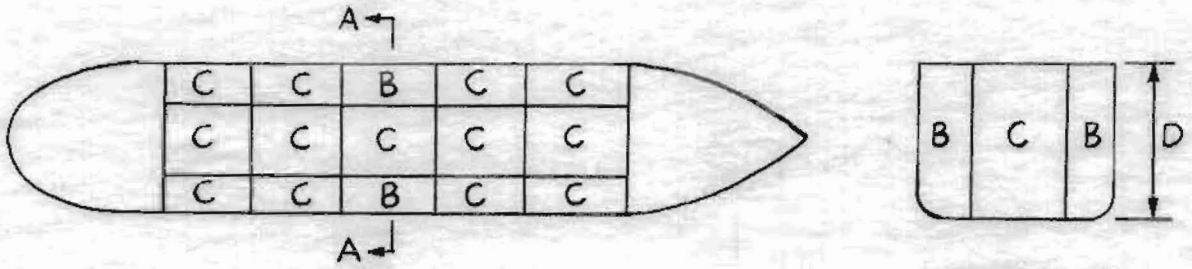


Fig. 1. Oil transported at sea annually (5).

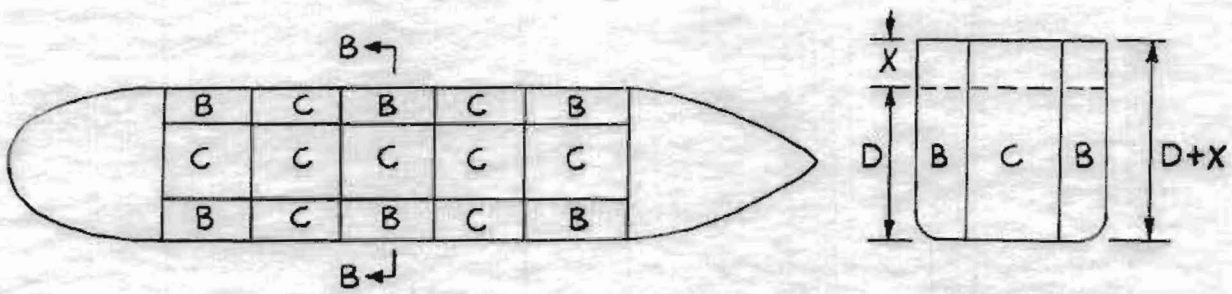
Marine Operations	Percent
Tankers, barges, other vessels	4.7
Offshore drilling and recovery	0.2
Subtotal	4.9
Land Operations	
Hydrocarbon fallout	90.0
Lubricant disposal-industrial & motor vehicle	5.1
Subtotal	95.1
Total	100.0

Table 1. Estimated oil pollution of the oceans (5), (11).



SECTION AA

CONVENTIONAL TANKER



SECTION BB

SEGREGATED BALLAST TANKER

B = SEGREGATED BALLAST TANK

C = CARGO TANK

D = DEPTH OF CONVENTIONAL SHIP

X = INCREASE IN DEPTH NEEDED TO RECOVER LOST CARGO VOLUME TAKEN BY ADDITIONAL WING BALLAST TANKS

D + X = DEPTH OF SEGREGATED BALLAST SHIP

FIGURE 2 : SEGREGATED BALLAST TANKER WITH ALTERNATING WING BALLAST TANKS (26)

TABLE 2 : COMPARISON OF MAJOR FEATURES OF INTERNATIONAL POLLUTION CONVENTIONS

ITEM	1954 (AS AMEND. IN 1962)	1973
1. Applicability as regards carriage of oil.	Seagoing tankers 150 gross tons and over, other seagoing ships 500 gross tons and over.	All oil tankers 150 gross tons and over, all other ships over 400 gross tons incl. novel craft and fixed and floating platforms.
2. Dispute settlement.	Referred to Internat. Court of Justice unless parties agree to arbitration.	Compulsory arbitration by specially formed tribunals upon application of any party to dispute.
3. Amend. procedure.	Effective only upon specific acceptance via IMCO Assembly and contracting states.	Speedier method for annexes and appendices via IMCO Committee and tacit acceptance procedures.
4. Application to ships of non-parties to the Convention.	No comparable provision.	Convention requirements shall be applied as necessary to insure no more favorable treatment is given to such vessels.
5. Definition of oil.	Limited to crude, fuel, heavy diesel, and lubricating oils; does not include bilge slops and fuel and lube oil purification residues.	Includes all petroleum oils except petrochemicals.

TABLE 2 (CONTINUED)

ITEM	1954 (AMEND. IN 1962)	1973
6. Enforcement mechanism for control of operational discharges.	No comparable provision.	Requires that monitoring and control system be in operation and a permanent record made whenever oily effluent is being discharged, except for clean or segregated ballast.
7. Requirements for substances other than oil.	No comparable provision.	Mandatory requirements for construction of chemical tankers and discharge criteria for liquid noxious substances in bulk; regulations for prevention of pollution by harmful subatances carried at sea in packaged form, or in freight containers, portable tanks, or road and rail tank cars.
8. Design and engineering requirements.	No comparable provision.	Establishes damage assumptions and methods of calculation of the amount of hypothetical outflow for tankers; establishes subdivision and damage stability criteria to be applied to tankers to increase survivability in the event of an accident.

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B

This is sort of short
less than 5,500 words.

There's a good deal of what I would call "preaching" in this — generalizing about the dangers of pollution and the need for action made imperative. When you finally get down to "solution" you have a highly legalistic discussion but little about the realistic conditions — i.e., how compelling are IMCO's actions? Have the 1969 provisions come into effect? What do the Developing countries want with respect to pollution control? How can willful negligence be established? What has been happening on the pollution issue at the Law of the Sea preparatory conferences?

THE TANKER AND OCEAN OIL POLLUTION

BY

RAYMOND COOMBS

There's a very good article on this subject in the recent Law of the Sea Institute Proceedings of the 1973 Bahamas Workshop.

Dr. Alexander

MAF 652

April 9, 1974

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