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TANKER POLLUTION

To Our Readers . . .

TWO events occurred recently which are of profound significance to all persons concerned with the oceans:

- At a meeting in February, the Inter-Governmental Maritime Consultative Organization (IMCO) offered new proposals to the world for curbing both willful and accidental pollution by oil tankers. The IMCO proposals were quickly embraced by the Carter administration.

- A few weeks later, the American supertanker *Amoco Cadiz* wrecked on the French coast. Man-kind witnessed, for the first time, the ultimate pollution horror of the tanker age: full loss of cargo by a Very Large Crude Carrier. The spill wrought utter devastation on one of Europe's most beautiful and bountiful shores. Scientists describe it as the greatest marine environmental disaster of our time.

We put together this special double issue of *Ocean Reporter* in order to give you early in-depth coverage of these landmark events.

Our own reaction to both of these events is a deep sense of unease. The IMCO agreement is a significant advance. But it was a compromise measure designed to win rapid international acceptance among shipping nations. That does not necessarily make it the most effective practical program to defend our own coasts, and waters within our own sovereign jurisdiction, against the kind of destruction that descended one dark night on the hapless residents of Brittany.

American scientists who visited the scene of the *Amoco Cadiz* spill came away with visions of foreboding. The wave action and topography of the French coast reminded them of stretches of New England, the Pacific Northwest and Alaska. They shuddered to think of the impact of such a massive spill in the quieter waters of Puget Sound or the Chesapeake Bay.

At the moment, America is spared the threat of the ultimate "superspill" by the fact that the largest tankers draw too much water to enter our ports. They transfer their cargoes to smaller coastal tankers in the Canadian Maritimes or the Caribbean. But that can soon change.

The Deepwater Port Act of 1974 set criteria for development of "monobuoy" terminals to receive the VLCCs off the American coast. The oil would be brought ashore by pipelines. Plans are afoot for construction of such ports in Texas and Louisiana. In April, the General Accounting Office proposed that the Secretary of Transportation study the feasibility of a deepwater port along the Mid-Atlantic coast, probably meaning off New Jersey or Delaware Bay.

Apart from being good economics, the system is touted for its environmental virtue of reducing

the number of smaller carriers that now congest our harbors. As Deputy Transportation Secretary Alan Butchman put it recently, "the operation of the deepwater port(s) will promote large scale substitution of Very Large Crude Carriers for smaller vessels."

Butchman meant this as an assurance about the forthcoming retirement of a number of pollution-prone small older tankers, not a scare statement about VLCCs. But it is difficult to read his statement without recalling a 1974 estimate by the Maritime Administration of what would happen if a loaded VLCC were "toted" off Delaware Bay: the spill could extend from Nantucket Island to Virginia Beach and cause damage to recreation and tourism in the neighborhood of \$2.8 billion.

To our mind, the American public is entitled to a federal policy on tanker safety as imaginative and technically advanced as are the policies on ports and oil distribution. The needs and costs should be translated into meaningful terms that will enable the public to make a choice—i.e., "how much shoreline protection is this policy likely to provide, and what will it cost me at the gas pump?"

For all its expertise, the Coast Guard is not the proper agency to make final determinations in this area; in a democracy, the role of a police agency is to enforce the laws, never to make them. The oil tanker safety issue is political and economic, more than technical and regulatory, and must be settled in the political arena.

And the choices about safety standards shouldn't be fudged just because our biggest tankship operators have committed themselves to a hull design that a number of experts now consider environmentally inferior. Tanker codes can always be applied selectively and progressively, starting with the ships that we permit to approach our most vulnerable and sensitive coastal areas. Present-generation tankers can be left to finish their days on the long ocean runs from the Mideast to the Caribbean, where risk of collision or grounding is less of a problem.

And let's not take for granted in our policy making that all costs of safer ships are ours to bear at the pump. Saudi Arabia has embarked on a program of fleet-building and "cargo preference" with the ultimate intention of carrying 50 percent of all its crude oil exports in its own ships. The Saudis are also in the midst of building a \$4-7 billion airport complex at Jiddah as a "national symbol."

The Saudis should know that the one national symbol that would impress the world would be an environmentally sound Very Large Crude Carrier. Isn't this the time to signal the Saudis, and all other oil transporters including our own, that such a tanker is the only kind we want near our shores?

— The Editors

Ocean Reporter

MONTHLY NEWS REPORT OF OCEAN WORLD MAGAZINE

April-May 1978

Tanker Pollution — What Now?

What does America do now to defend its shores against pollution while at the same time bringing vast amounts of oil through sensitive waters and crowded ports to sustain national economic life?

The question flares anew in the wake of the stunning break-up of the tanker *Amoco Cadiz* off northwestern France in March.

A month earlier, at the instigation of President Carter,

delegates from 62 nations gathered in London to draft a series of new international standards for construction of oil tankers, so as to better protect the seas from pollution.

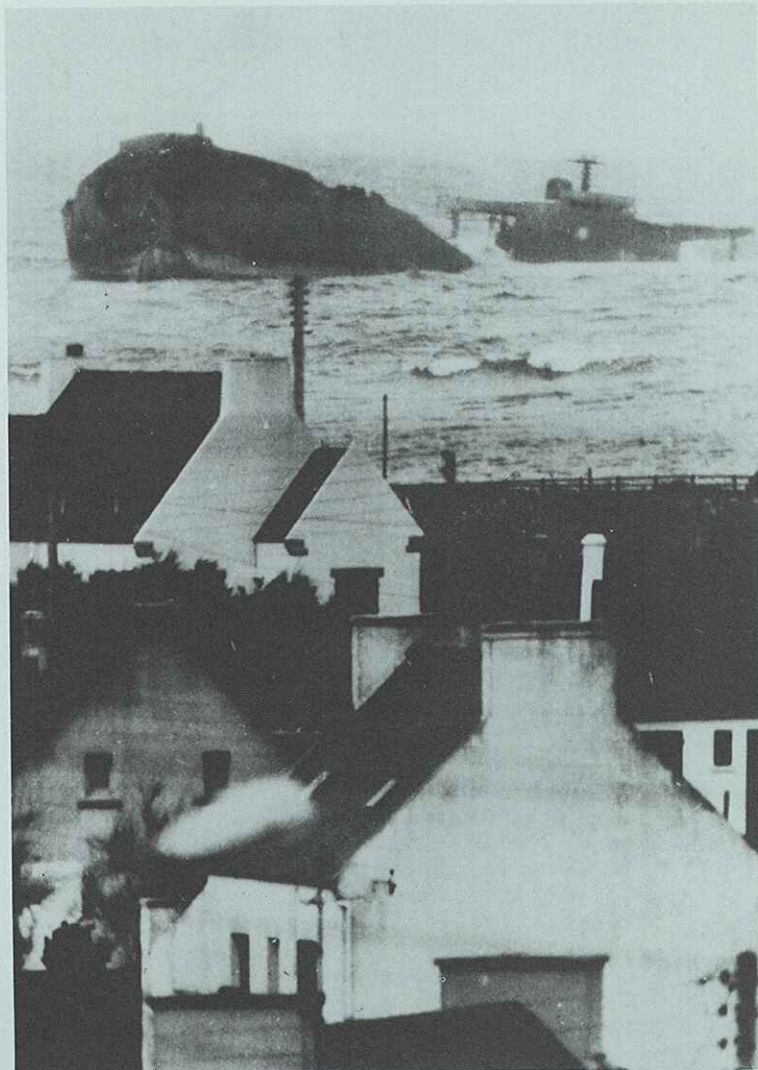
The meeting was convened by the Inter-Governmental Maritime Consultative Organization (IMCO), an affiliate of the United Nations.

On March 16, only weeks after the delegates returned home with their recommendations, the *Amoco Cadiz*, an American-owned 230,000 dead-weight ton (DWT) supertanker, lost its steering and drifted onto the rocks off the coast of Brittany.

Nothing better illustrates the international character of modern tanker operations than the wreck of the *Amoco Cadiz*. An American-owned ship, built in Spain, chartered to a multinational company, manned by an Italian crew and registered in Liberia, ran aground off France while bound for England and Holland with a cargo of Arabian oil.

The ship broke in half in high winds and seas and ultimately spilled its entire 216,000 metric ton cargo of light Arabian crude oil, and 4,000 tons of its own fuel, onto the waters and beaches of the French province. It was the worst tanker spill known to mankind, losing two to four times the amount of oil that was released in the worst previous disaster, the ground-

THE AMOCO CADIZ, as it broke up off Portsall, France. UPI photo.



ing of the *Torrey Canyon* off the southwestern coast of England eleven years earlier, March, 8, 1967.

Direct loss in the *Amoco Cadiz* spill was some \$23 million of cargo and a ship that experts say would cost \$70 million to replace. *Amoco's* liability for damage to French tourist, fisheries and seaweed industries will be a subject of protracted litigation.

The local Bretons were innocent victims of a relatively modern peril in shipping, accentuated in the 1960s with the birth of the monster supertanker to help eliminate Western dependence on the Suez Canal. Shipwrecks have plagued man since antiquity. But losses were counted in ships, men and cargo. Only in modern times has the potential peril extended to the ocean itself and to every coastline passed between loading point and destination.

The wreck of the *Amoco Cadiz* pointed up the challenges faced by maritime lawyers, marine insurers, ship designers, ship owners and government regulators in the age of the supertanker.

The fact that the *Amoco Cadiz* was said to meet all international safety requirements also raised anew the question of the efficacy of IMCO rules in preventing ocean pollution. IMCO celebrated its 20th anniversary as "World Maritime Day" March 17 — the day the *Amoco Cadiz* broke in half.

Oil companies have long urged reliance on IMCO as a means of developing standards for tanker construction and operation that will be uniform worldwide. Detractors, pointing to weaknesses in many of IMCO's compromise rules and

long delays in member-state ratification, have tended to view IMCO as something of a great international placebo, making the public feel good without administering real medicine.

This February, under American prodding, IMCO agreed to its toughest standards to date, in the form of amendments to a 1973 convention which has yet to enter force for want of member state ratifications. A sense of urgency was reflected in a resolution urging member states to adopt the new rules unilaterally for ships coming into their own ports, without awaiting the tedious ratification process.

Deputy Secretary of Transportation Alan Butchman returned from London hailing the agreement as being "the best solution we could get," achieving at the international level "most of the tanker safety initiatives proposed last year by President Carter."

The U.S. Coast Guard, which operates under Butchman's department, immediately began codifying the new rules for implementation this year with regard to all ships entering U.S. waters. (Notice of intention to issue new rules was published in the Federal Register April 20. The rules will be subject to public comment and will become final over the next nine months unless modified.)

But the *Amoco Cadiz* catastrophe soon took some of the bloom off the sense of achievement at London. In truth, the United States had backed down and accepted compromise measures whose effectiveness is questioned by some tanker experts.

The two major anti-pollution measures rejected in London were mandatory "double bot-

toms" for new tankers — intended to reduce or prevent spillage in tanker groundings — and "segregated ballast" systems for existing tankers — intended to eliminate pollution resulting from discharges of ballast water into the sea after it has been carried in the ship's dirty cargo tanks between loaded voyages.

President Carter called for implementation of both measures, for all ships coming into U.S. waters, in a March 1977 message to Congress following the rash of spills the previous winter beginning with the breakup of the *Argo Merchant* off Nantucket.

The Coast Guard incorporated the measures in proposed rules introduced at the time of the President's message.

The first sign of erosion of the Administration's strong 1977 position came in November when the President's Council on Wage & Price Stability said the cost of retrofitting existing ships with segregated ballast tanks might be "needlessly inflationary." (*Ocean World* 1/78, p. 23)

Soon after, the American Institute of Merchant Shipping (AIMS) and the American Petroleum Institute (API) issued a joint industry position paper "strongly" opposing mandatory double bottoms and segregated ballast retrofit, but conceding it "would be progress" to require segregated tanks on new ships over 20,000 deadweight tons. As an alternative to double bottoms, AIMS and API proposed that the segregated ballast tanks be placed in protective locations along the sides and bottom of new ships. This would serve a dual purpose of keeping ballast water clean and

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serving as a buffer for the cargo tanks in event of grounding or collision. The AIMS/API statement did not specify the percentage of hull area that would be protected by the segregated tanks.

For existing ships, AIMS/API recommended a number of cost-effective measures developed by the industry for minimizing the amount of oil carried into the sea with ballast water discharges, short of putting the ballast in separate, dedicated tanks. These measures include a relatively new and more thorough system of tank cleaning called "crude oil washing," an established system for separating tank "slops" from the ballast water called "load on top," and use of shore facilities to receive the tanks slops after the ballast water has been cleansed and pumped overboard. (For explanation of these systems, see p. 9)

In advance of the IMCO meeting, Transportation Secretary Brock Adams noted that one of the industry alternatives, crude oil washing, "is a technique developed for its commercial advantage, not its environmental benefits," but Adams said his department was "prepared to consider (it) in some degree at least, provided we can obtain enough information to conduct a fair evaluation."

Speaking to a gathering of the Oil Companies International Marine Forum (OCIMF), Adams also said the U.S. would be willing to consider protectively located segregated ballast tanks as an alternative to double bottoms on new ships, "provided the formula for protective space in fact would truly provide sufficient cargo protection."

Adams was evidently satisfied with the information he received. The Administration dropped its threat to proceed

unilaterally with its requirement for double bottoms and retrofitting, and the oil industry proposals basically prevailed at the IMCO meeting in London.

The essential outline of the package deal worked out in London was as follows:

- New crude oil tankers 20,000 DWT and over, and new refined product carriers 30,000 DWT and over, must be built with protectively located segregated ballast tanks, covering 45 percent of the sides and bottom for smaller tankers, down to 30 percent or less coverage of hull area for ships 200,000 DWT and over.

- Existing crude carriers can get by without segregating their ballast water if those ships 40,000 DWT and over install and use crude oil washing systems. Product carriers of that size must segregate their ballast, but can avoid retrofits by reserving some of regular cargo tanks

FIFTEEN THOUSAND French workers parade through Brest protesting the Amoco Cadiz spill. AFP photo.



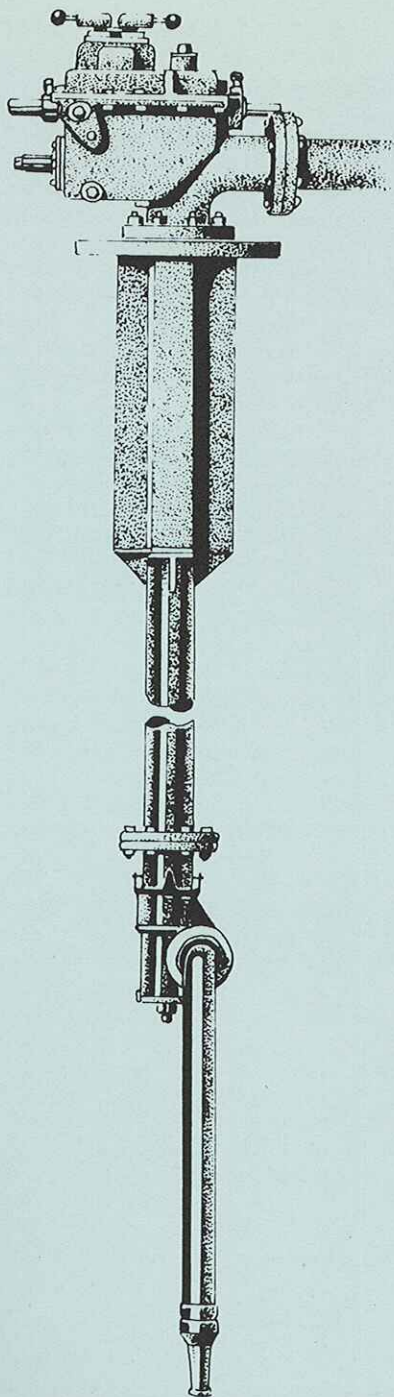
for ballast water. The target date for implementation is 1981.

Deputy Secretary Butchman said on his return that he was "extremely hopeful" Congress will not now upset the compromise by legislating for double bottoms. That would have a "very detrimental effect on IMCO."

The first Congressional look at the IMCO proposals came in April 5 hearings of the Senate Commerce, Science and Transportation Committee called by Sen. Warren G. Magnuson (D.-Wash.) Magnuson has been the leading Congressional advocate of double bottoms and other measures to safeguard American waters — particularly those of his beloved Puget Sound. His own bill (S.682), requiring double bottoms and numerous other safety systems for tankers built after 1980 and calling in U.S. ports, was passed by the Senate last year and awaits action in the House. One objective of the hearing was to convince Magnuson that the new IMCO/Coast Guard recommendations would sufficiently protect U.S. coastal waters.

The hearing revealed an apparent split within the Administration over the IMCO proposals, and demonstrated some muscle-flexing on the part of the new Office of Ocean Management of the National Oceanic and Atmospheric Administration. The Office's director, Samuel A. Bleicher, had attended the IMCO meeting — the first time a NOAA representative had ever done so.

With Bleicher at his side, James P. Walsh, NOAA deputy administrator, called for prompt ratification of the IMCO agreement and implementation by Coast Guard regulations. He praised Deputy Transportation Secretary Butchman, and the Coast Guard officers who had accompanied him to London, for their hard work, and credited them with extracting from the IMCO forum "just about everything the United States could possibly have hoped to obtain given the initial attitude of many of the other delegations."



CRUDE OIL washing mechanism: less ballast pollution, more fumes released in port.

Then he proceeded to dissect the proposals, so far as their adequacy for preventing pollution in U.S. waters:

- The agreements "are not the same as what the President

proposed in his March, 1977 message."

- By exempting existing product tankers under 40,000 DWT from any requirements for segregated ballast, the proposal leaves the existing product tanker fleet "largely unaffected." In fact, Walsh said, "only 8 percent of the U.S. flag product tankers are that large."

- Crude oil washing (COW) "will not wholly eliminate the discharge from deballasting operations, which will remain a significant source of operational pollution. Moreover, COW may create significant air pollution problems by creating additional vapors that are released from the receiving facility, and it has been opposed by the State of California Air Resources Board for that reason."

- The operative effect of "protective location" of ballast tanks on new tankers, as an alternative to double bottoms, is "uncertain."

- "The requirement that new tankers have both segregated ballast and crude oil washing, without similarly stringent requirements on existing tankers, combined with the worldwide tanker surplus, will discourage the construction of new tankers and extend the utilization of existing tankers with less effective pollution controls."

Walsh also noted that in order to gain support for early ratification, IMCO had agreed to delay for at least three years the effective date of Annex II of the 1973 Convention, which prohibits discharge into the oceans of a broad category of noxious substances other than oil. (IMCO members reportedly were having difficulty providing onshore reception facilities for residues of chemical cargoes.)

Walsh called for a review in 1980 of "whether the promise of widespread ratification and a new level of international tanker pollution control has indeed come to pass." If it has not, the U.S. should again consider unilateral adoption of the President's original proposals, Walsh said.

He also called for an evaluation of whether the IMCO pro-

posals were adequate for U.S. flag vessels in the American coastal trade. (Butchman testified that the Coast Guard expected to have recommendations by May 1 on whether stricter standards should be applied to U.S. vessels in coastal waters.)

Walsh also proposed a study of whether standard international emergency procedures should be established for responding to tanker accidents. "The events leading up to the grounding of the *Amoco Cadiz* are an unfortunate reminder of the confusion which too often ensue during emergency situations involving tankers at sea. Society pays a high price for the lack of adequate legal arrangements to cope with such situations."

Katherine Gillman, of the President's Council on Environmental Quality, expressed "regret" that IMCO "weakened" the U.S. proposals by not making segregated ballast mandatory for existing tankers, exempting new product tankers under 30,000 DWT and existing product tankers under 40,000 DWT from segregated ballast requirements, and substituting protectively located ballast for double bottoms on new tankers. "Segregated ballast is safe, reliable, virtually self-enforcing, offers important air pollution benefits, and almost wholly eliminates oil discharges from ballasting operations," Gillman

said. "The Council views crude oil washing as a valuable supplement, but not a substitute."

The exemption of new product tankers under 30,000 DWT and existing product tankers under 40,000 DWT from the segregated ballast options means that "many product tankers will escape the protocol's requirements," Gillman said.

As for substituting protectively located ballast space for double bottoms, Gillman said the view of the Council was that the value of double bottoms in preventing spills "is solidly documented, whereas the effects of protective location are not documented and are less certain."

Nonetheless, Gillman said, the IMCO requirements were a "long step forward" and should be ratified by the U.S. She also urged more "research and persuasive presentation" showing the "burden and distribution of costs of different pollution control measures among countries, oil companies, shipowners and consumers."

The appeal for better cost breakdowns was echoed by James N. Barnes of the Center for Law and Social Policy, representing a number of environmental groups. "The figure of \$6 billion was kicked around at IMCO for segregated ballast retrofit . . . not the fact that it works out to fractions of a cent per gallon at the pump."

Barnes said the Coast Guard "accomplished more at this session of IMCO . . . than any of the environmental groups believed was possible," and the agreements should be ratified even though the package "fails to measure up to the United States objectives."

However, Barnes said, the Coast Guard should move immediately to apply the full range of safety requirements to American-flag ships in coastal waters — double bottoms, twin screws, bow thrusters, split rudders and collision avoidance systems for new tankers, and segregated ballast and inert gas systems for existing tankers down to 20,000 tons.

Barnes also questioned the need to await international response to the IMCO proposals before moving ahead with stronger unilateral standards for all ships using U.S. ports. "Because so much of the world petroleum trade is destined for the United States, and because United States-controlled companies make up such a large part of that trade, the environmental groups believe that imposition of stringent standards on all vessels which seek to enter United States waters and on all vessels owned or controlled by United States nationals and corporations would make the United States standards the effective world-wide norms, whatever IMCO does."

Other Readings . . .

Oil Transportation by Tankers: An Analysis of Marine Pollution and Safety Measures. Office of Technology Assessment, U.S. Congress, July 1975, \$2.80. Government Printing Office, Washington, D.C. 20402.

Oil and Gas in Coastal Lands and Waters. Council on Environmental Quality, April 1977, \$2.75. Government Printing Office, Washington, D.C., 20402.

International Cooperation for the Prevention of Marine Oil Pollution, Andrew W. Anderson and William K. Bissell, September 1975, \$3. University of Miami Sea Grant Program, Coral Gables, Fla. 33124.

Supership, Noel Mostert, 1974, Albert A. Knopf, New York.

Other News in Brief . . .

Shift at Geneva

In a shift of position following the *Amoco Cadiz* spill, the U.S. Law of the Sea delegation called in April for recognition of the right of coastal nations to take action against violations of international pollution codes in their 200-mile fishing and resource zones.

Under the proposals advanced by Ambassador Elliott Richardson at the current Law of the Sea meeting in Geneva, coastal nations could also move against violators beyond the 200-mile zone if the violations were sufficiently grave.

Prior to introduction of the new proposal, the Sea Law conferees had settled on a formula which attempted to balance the rights of coastal or "port" states to protect themselves against pollution with the traditional rights of "flag" states — states of ships' registry — to police their own fleets on the high seas.

Under the tentative formula worked out at last year's Law of the Sea meeting in New York, coastal nations could punish violations in their own ports and contiguous waters, while violations farther at sea could be reported to other port states where the ship was expected to call. These states could, at their option, take action against the ship when it reached their waters, but the action could be pre-empted by the ship's flag state if the flag state asserted jurisdiction over the violation within six months.

Except in clear emergencies, coastal states now have few rights to act against ship pollution in their 200 mile zones other than to report violations to the ship's flag state and hope for action.

Certain rights to punish polluters in the 200-mile zone were asserted by the United States in 1977 amendments to the Clean Water Act, but the language was not cleared with the State Department Law of the Sea office

and is considered by that office to be inconsistent with the U.S. position at New York and Geneva in protecting freedom of navigation.

Congressional leaders have reportedly given assurances they will move to change the wording of the 1977 amendments if the new Law of the Sea proposals are adopted.

The right of port states to punish pollution violations in their own territorial waters is recognized in the yet-to-be-ratified 1973 IMCO Convention on marine pollution, and was asserted by the U.S. in the 1972 Ports and Waterways Act which gives the Coast Guard broad regulatory powers over all ships entering U.S. waters.

Coastal Zone Suits

The American Petroleum Institute has filed three suits challenging state coastal zone management programs in California, Massachusetts and Wisconsin.

At issue is approval by the federal Office of Coastal Zone Management (OCZM) of the three state plans. Approval would mean federal funds for the states and, more importantly both to the states and to API, it would call into play the "federal consistency" provision of the Coastal Zone Management Act of 1972.

Under this provision, once a state plan receives federal approval, future federal actions affecting the state's coastal zone — including the issuance of permits to oil companies for offshore exploration and development — must be consistent with the state plan.

The API suits focus on amendments to the Act in 1976 which established a Coastal Energy Impact Program to help states prepare for and deal with the effects of such activities as outer continental shelf oil and gas development. The amendments required that, to be approved by OCZM, a state program must

consider the "national interest" in siting of energy facilities which serve needs beyond those of the local area.

This requirement, API charges, has not been met in the three programs before the courts. Nor have many other requirements, API claims, and the lawsuits are loaded with citations of deficiencies in the programs and in OCZM's review of them.

The U.S. District Court in Los Angeles is expected to issue its opinion on the California case in May. Judge Aubrey Robinson in Washington, DC will hear the Massachusetts and Wisconsin cases early this summer.

Meanwhile, California, by court order, cannot require federal consistency with its program, approved by OCZM last fall. Massachusetts' program was approved in April after Robinson refused to enjoin the action pending a full trial, and the state has full use of the consistency provision. Wisconsin's program has yet to be approved. The courts may yet revoke OCZM's approval of any or all of these.

API sources are confident the courts will rule in the industry's favor.

State and federal officials are just as confident that API's litigiousness results not from its desire to see the law upheld but from its desire to undermine the coastal program.

Richard Frank, head of the National Oceanic and Atmospheric Administration in which OCZM resides, called the Massachusetts suit "part of a pattern of opposition" to state coastal management programs. Massachusetts Lt. Gov. Tom O'Neill said his state had worked with the oil companies "since January to meet their concerns" but the "oil companies have not bargained in good faith." Instead, he said, the companies "prefer to sabotage the entire national coastal zone management plan effort on a state-by-state basis."

Asked to respond to the charges, an API source said, "That's so ridiculous."

'Willful and Intentional Pollution'

— Solving the Big Problem

Deliberate operational pollution puts far more oil into the waters than the dramatic accidental spills. IMCO and the oil companies rely on "Load On Top" and "Crude Oil Washing" as the primary defense against deliberate pollution by the present generation of tankers. Here's how these systems work.

ALTHOUGH tanker smashups on the scale of the *Amoco Cadiz* or *Torrey Canyon* disasters cause severe local pollution and capture world attention, they are not the chief source of oil tanker pollution at sea.

A study distributed by the Coast Guard in 1975 estimated that accidental spills were putting about 350,000 tons of oil into the oceans every year. But nearly four times that amount is dumped into the sea *deliberately* by oil tankers in the normal course of operations.

The deliberate dumping comes when ships clean their cargo tanks for inspection or shipyard repair, or to take on a different type of petroleum product; or when they discharge seawater carried in the oily cargo tanks as ballast when the ship is running empty — as on the return trip to the oil field; or when they pump out their bilges.

The amount of oil discharged through these operational procedures is estimated at 1,370,000 tons a year — about the same as if six supertankers the size of the *Amoco Cadiz* roamed the globe every year intentionally pumping their entire cargoes into the sea.

While the international conventions on oil pollution deal extensively with measures to avoid or mitigate accidents, they give as much attention or more to the problem of deliberate discharge. One stated objective of the 1973 IMCO Convention is to bring about — "certainly by the end of the decade" — "the complete elimination of the willful and intentional pollution of the seas by oil."

IMCO sought to accomplish this objective by imposing design standards for tankers that would give ship masters less cause to make intentional discharges.

One of the standards proposed in 1973 was the inclusion of separate ballast tanks in new tankers 70,000 DWT and over ("new" meaning placed on order after Dec. 31, 1975, and/or delivered after Dec. 31, 1979). This would obviate the need to mix ballast water with oil slops in the cargo tanks.

However, for smaller new ships, and all existing ships, IMCO placed primary reliance on an industry system known as "load on top" for minimizing pollution of the water taken on for ballast and tank washing. The system depends on careful managing of the dirty water and tank slops so that the slops separate from the water during the ballast voyage. If the weather is kindly and the crew diligent, the slops will form a layer on the water. The slops can then be pumped into a cargo tank reserved for the purpose, and the ballast and wash water can be pumped overboard relatively free from oil. A new cargo is then "loaded on top" of the slops remaining from the old cargo.

One drawback is that the system does not work well in rough weather; another is that the retained slops contain some seawater, and cannot be mixed later with an oil-product cargo as the cargo would become contaminated. For this reason, the load-on-top system is traditionally used only in crude oil service where some water contamination is acceptable, not in tankers carrying refined products. "Product" tankers generally need on-

shore reception facilities to rid themselves of unwanted slops.

The IMCO meeting this February put the weight of international approval behind an improved tank cleaning system developed by Exxon, British Petroleum and others within the last few years. The system, known as "crude oil washing," consists of using some of the ship's own cargo oil as a washing medium during the unloading process. The oil is pumped under pressure through nozzles installed in the cargo tanks, loosening and dissolving much of the sludge and residue remaining on the tank sides and structural parts. Because of the solvent quality of the wash oil, the tanks are cleaned more thoroughly than is the case with traditional water washing. Also, because the operation is carried out concurrently with unloading, more of the cargo is recovered, as much as an additional 1,000-1,500 tons in the case of large carriers.

Exxon has estimated it saves \$100,000 per vessel each year through numerous operational benefits deriving from the process. For safety reasons, crude oil washing is used only on ships with systems for putting inert gas into the cargo tanks and the system is operable only if the ship has permanently fixed piping and nozzles for tank washing.

The environmental bonus of crude oil washing is somewhat cleaner cargo tanks for carrying water ballast. Load on top methods are still used to purify the ballast water before discharge, but only a third or fourth as much oil residue has to be dealt with.

In addition to encouraging use of "load on top" and "crude oil washing," IMCO has set international standards for the amount of oil that can be discharged into the sea when these methods fail, or are not fully effective. Any residues in excess of the permissible discharge levels are supposed to be transported to shoreside reception facilities.

Until this year, there was no effective limitation on discharges beyond 50 miles of land; however, with the coming into force Jan. 20 of restrictions proposed by IMCO back in 1969, ships on route are prohibited from discharging more than 60 liters of oil per mile traveled, with an upper limit of 1/15,000 of the previous cargo. Somewhat tighter restrictions were proposed by IMCO in 1973, but these will not take effect until the 1973 Convention is brought into force by international ratification.

The 1973 IMCO Convention also calls for ship-board systems to control, monitor and record discharges, and requires slop tanks adequate to hold residues in excess of the permissible discharge level until the ship reaches a port with facilities to receive them. Signatory nations are required to make sure reception facilities are available.

The monitoring systems have a policing feature, in that port inspectors can check the record to tell how much oil was discharged during the voyage.

The systems cost between \$150,000 and \$200,000 to install, and the 1973 IMCO Convention does not make them mandatory on existing ships until three years after the Convention comes into force.

Crude oil cleaning with GUNCLEAN[®] is economic, efficient and reduces pollution.

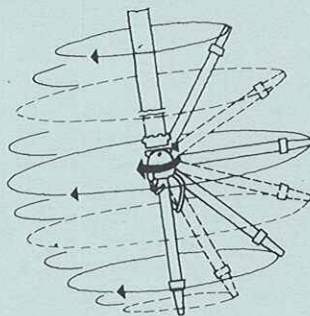
\$100,000 saved within two years due to increased cargo outturn.

Cleaning time reduced from the 8 days required for water cleaning to 2 1/2 days.

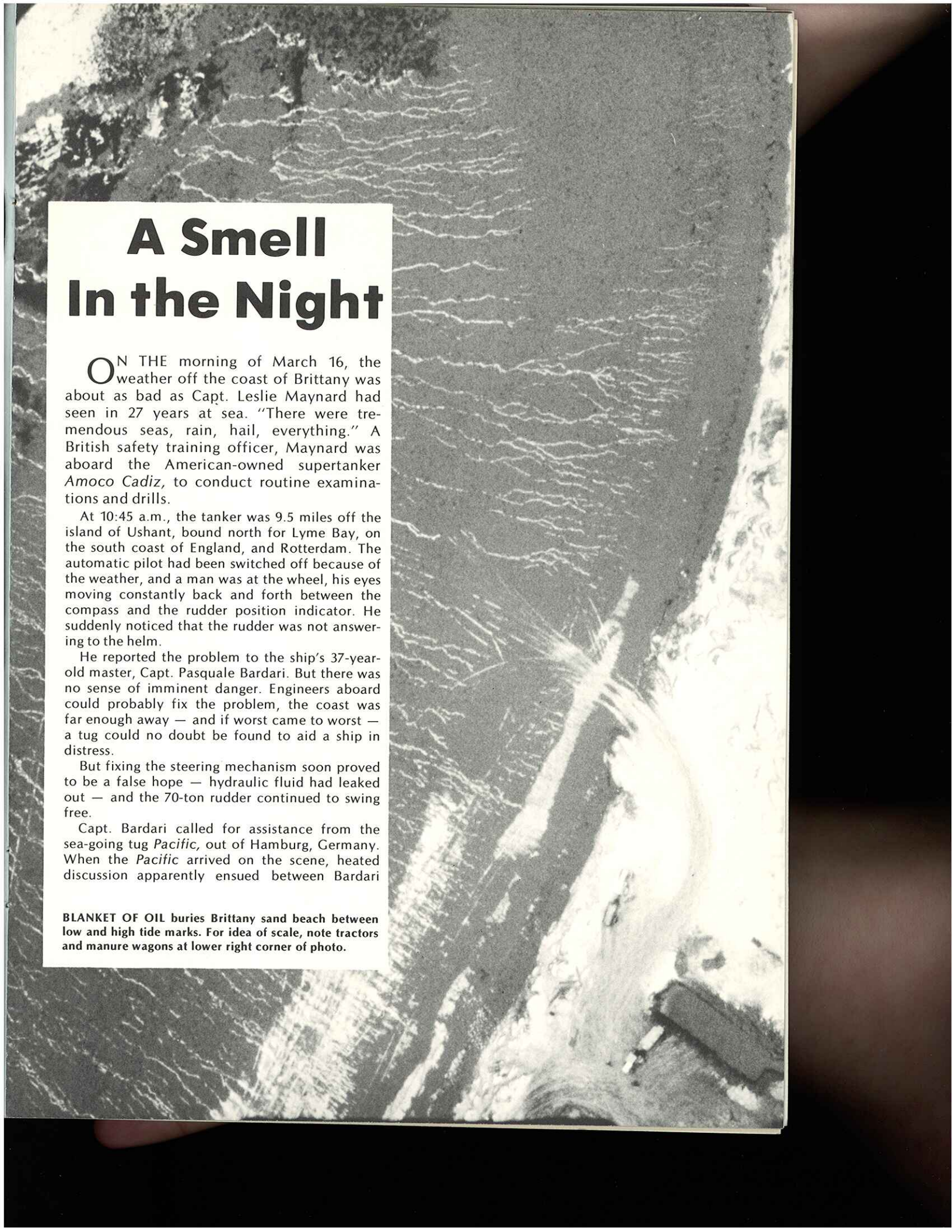
Corrosion reduced. As sea water need never be introduced into 2/3 of the tanks between dry-dockings.

Pollution reduced by minimizing the amount of oil-contaminated cleaning water that must be disposed of.

GUNCLEAN has been used for crude oil cleaning since 1967 and these days all GUNCLEAN models, old as well as new, are used for all current crude oil cleaning techniques.



CRUDE OIL WASHING, adopted by IMCO as a substitute for expensive retrofitting of tankers with segregated ballast systems, has its operational as well as pollution benefits, as this ad excerpt points out.



A Smell In the Night

ON THE morning of March 16, the weather off the coast of Brittany was about as bad as Capt. Leslie Maynard had seen in 27 years at sea. "There were tremendous seas, rain, hail, everything." A British safety training officer, Maynard was aboard the American-owned supertanker *Amoco Cadiz*, to conduct routine examinations and drills.

At 10:45 a.m., the tanker was 9.5 miles off the island of Ushant, bound north for Lyme Bay, on the south coast of England, and Rotterdam. The automatic pilot had been switched off because of the weather, and a man was at the wheel, his eyes moving constantly back and forth between the compass and the rudder position indicator. He suddenly noticed that the rudder was not answering to the helm.

He reported the problem to the ship's 37-year-old master, Capt. Pasquale Bardari. But there was no sense of imminent danger. Engineers aboard could probably fix the problem, the coast was far enough away — and if worst came to worst — a tug could no doubt be found to aid a ship in distress.

But fixing the steering mechanism soon proved to be a false hope — hydraulic fluid had leaked out — and the 70-ton rudder continued to swing free.

Capt. Bardari called for assistance from the sea-going tug *Pacific*, out of Hamburg, Germany. When the *Pacific* arrived on the scene, heated discussion apparently ensued between Bardari

BLANKET OF OIL buries Brittany sand beach between low and high tide marks. For idea of scale, note tractors and manure wagons at lower right corner of photo.

and the tug's master, Reinhart Weiner, over the towing contract.

By 2:15 p.m. a deal had been struck and a tow line was fixed to the drifting tanker. During the afternoon, French navy Atlantic zone headquarters at Brest radioed Bardari to ask if additional help was needed. He replied that it was not. The navy did not go on the alert. "This was a civilian vessel. It had a tug in attendance," Adm. Jacques Coulondres, commander in chief at Brest explained later. In the absence of a distress call, the navy considered itself constrained by maritime law from intervening and it had no vessels designed for the task in any case. Its proposals for two supertugs to guard the coast had fallen on deaf ears for years.

Around 5:15 p.m. the towline broke. Several more towing attempts failed. the tanker was blown ever closer to shore. At 10:04 p.m., according to a log kept by safety officer Maynard, the *Amoco Cadiz* impaled itself on jagged rocks off the little French fishing village of Portsall.

Capt. Bardari then gave a distress signal and helicopters arrived to remove the crew. Man's greatest ocean environmental disaster had been nearly 12 hours in the making.

NOW deserted, the *Amoco Cadiz* pounded on the rocky bottom through the night. Widening holes were torn in the underskin of the ship, exposing one cargo tank after another to the action of the sea. As the oil gushed out, it formed an emulsion with the seawater, doubling in volume. Winds, waves and high tides spread the "chocolate mousse" (as spill specialists call it) rapidly along the shore and high on the beaches, depositing it in layers five to six inches thick. In some places the oil splashed over breakwaters onto village roads. Small beach creatures scurried inland and crabs climbed seagrass in a futile effort to escape.

MARIANNE LEDOEC, a short 80-year-old peasant woman, was awakened by the smell. It was the first strong whiff of oil vapors that would rise from the French beaches for several weeks, bringing nausea to scientists and clean-up workers and sending some to hospitals. "We thought it was a car accident," Mrs. Ledoec said. "Finally we saw them sending up lights from the ship." She and a neighbor gave the sailors coffee after the helicopters brought them ashore.

Mrs. Ledoec sent her son to alert the village. The word spread along the coast. Lobstermen hastily set out booms to protect their shoreside pens. In the morning, oystermen began to remove infant spat from the water and store it in barns. Salvage experts were called, and plans were laid to get pumps aboard to lighten some of the load into smaller tankers. But the weather worsened. Gales force winds and waves up to 30 feet made salvage impossible. On the third day the ship broke in two.



As the devastation spread, there was talk of setting the ship afire to stem the spillage. But calculations showed that the rate of outflow from the wreck so far exceeded the rate the oil could be consumed by burning that firing the ship would be futile. The resultant smoke would only add another pollution burden to the surrounding farmland.

And so, like a giant beer can slit on its belly, twisted and broken, the *Amoco Cadiz* gave its entire contents to the sea.

AFTER the spill, the sea began giving up its dead. Sea urchins washed up on the beaches in windrows, 16 million per mile of beach. Later came razor clams, then cockles. Oil-coated seaweed washed up everywhere — in an area that provides 80 percent of Europe's supply for pharmaceuticals, food and fertilizer.

At the Seven Islands bird sanctuary, several species appeared to have been annihilated, according to the first observers to reach the islands.

A 2,000-acre salt marsh 90 miles from the scene of the spill was covered ankle to waist deep in oil. Scientists questioned whether it would ever be restored. Protective floating booms proved useless in keeping the "mousse" out of sensitive areas; it simply oozed under the booms.



ABOVE: Like modern King Canutes, Brittany farmers with tractor and manure tank (right center) do battle with tide of oil stretching as far as eye can see.

Wave action mixed the oil with seawater down to 60 meters beneath the surface, endangering shellfish and other underwater organisms. The extent of destruction to local mussel and oyster beds would take years to assess.

In places, the high-energy water action also mixed the oil into beach sand. "You can walk along what appears to be a clean beach, and then you look back and oil is seeping into your footprints," an American observer said.

THE heroes of the cleanup attempt were farmers with their tractors, pumps and pig manure tanks, sucking up gallon by gallon the oil left on the beaches between high and low tide marks. Whatever could be recovered was trucked to a refinery in Holland. Others labored with shovels, squeegees, mops and rags. Children attempted to scrub oil off rocks one by one. But with oil spreading along some 200 linear miles of coast — perhaps 700 miles of actual shoreline when you count footage along all the bays and inlets — cleanup workers could make only a miniscule dent. One scientist said he doubted more than a third of the oil could ever be recovered; only about 5,000 tons, or 2 percent of the ship's cargo, had been removed by mid-April.

(Continued on next page)

BELOW: Hatchmarks show main initial spill area. Oil continued to move around in the sea weeks after the wreck; by the end of April it had reached Brest harbor.

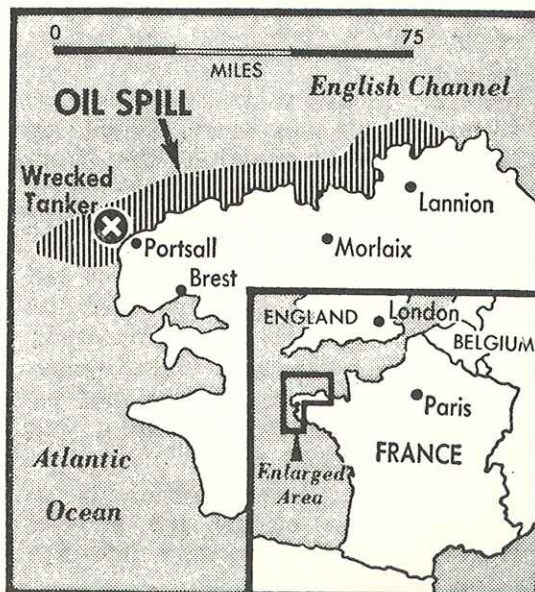


PHOTO CREDITS: Front and back covers and page 11, NOAA. This page and next, U.S. Environmental Protection Agency. Map courtesy Washington Post.



ABOVE: Residents of Portsall, at site of wreck, attempt to remove supertanker's load with large cans and pump trucks.

ERIC SCHNEIDER, head of the Environmental Protection Agency's largest research laboratory at Narragansett, Rhode Island, was among the American observers who assembled at the scene.

He was staggered by what he saw. "I would have to say it is potentially the largest environmental disaster in the oceans yet known." Schneider could not liken it in scale to any previous event impacting the oceans except perhaps the emergence of the Krakatoa volcano in the 1800s.

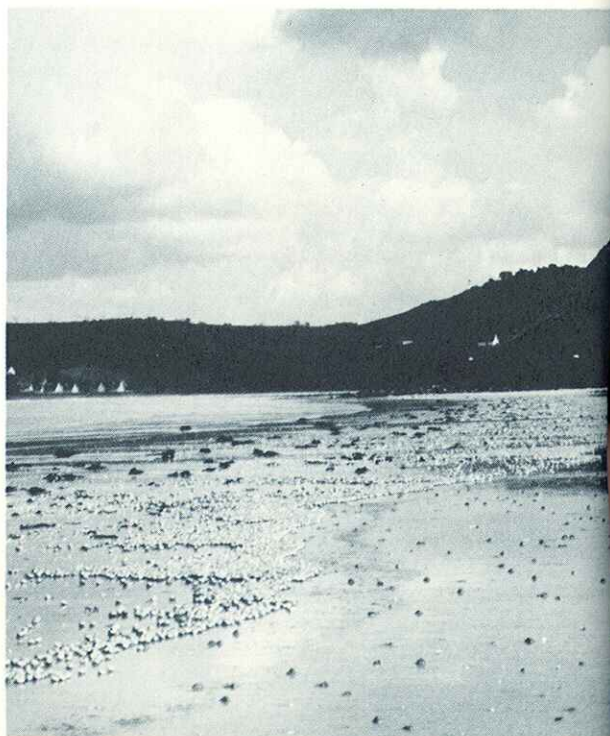
"America has got to learn the lesson of this," Schneider said. He was "appalled at the apathy" he found on returning to Washington, even among officials who deal with environmental problems.

The spill was "many, many times" larger and more damaging than the 1969 offshore drilling spill at Santa Barbara, Calif. that was so upsetting to Americans, Schneider said.

The French were fortunate, in a sense that the spill occurred on a "high energy" shore where wind and wave action could push and shove the oil around, he added. "I'd hate to think of anything like this happening in quieter areas like Puget Sound or the mangrove swamps of Florida and Georgia.

"We don't want another one . . . I don't know how but we must do everything to ensure that we don't go through one of these on the American coast. there is no way you can prepare for something like this. It is just utter devastation."

BELOW Dead sea urchins wash up on a Brittany beach.



Carter's 1977 Program: Where It Stands Today

The breakup of the tanker *Argo Merchant* off Nantucket Island, Mass., in December 1976, followed by a spate of other highly publicized accidents, led to a widespread public outcry over the tanker spill problem.

Why was this "rustbucket" — to use Rep. Gerry Studds (D.-Mass.) term for the *Argo Merchant* — even allowed in U.S. waters? And what should the United States do to prevent or mitigate such disasters in the future?

President Carter hastily set up an Interagency Oil Pollution Task Force to provide him with recommendations, and on March 17, 1977, the President announced his proposals in a message to Congress. The President's program included, or called for, the following actions:

- U.S. ratification of the International Convention for the Prevention of Pollution from Ships, 1973.

- Assembly of a special international conference to discuss stricter standards for oil tanker construction, equipment, and inspection.

- Submission to Congress of comprehensive oil spill liability and compensation legislation to assure that citizens damaged by oil spills are fully covered for their losses.

- Establishment of a U.S. Marine Safety Information System, coupled with a Tanker Boarding Program, to identify and take action against tankers with long histories of poor maintenance, accidents, and pollution violations.

- Improvement of crew standards and training.

- Improved response to oil pollution emergencies, with the goal being the ability to "respond" within six hours to a spill of 100,000 tons.

- Regulatory action by the Department of Transportation (i.e. by its seagoing arm, the U.S. Coast Guard) to establish new standards for all tankers entering U.S. ports.

Proposed construction and equipment regulations would include double bottoms, segregated ballast, inert gas systems, backup radar systems with collision avoidance equipment, and improved emergency steering standards for U.S. and foreign tankers over 20,000 deadweight tons entering U.S. ports. These requirements would take full effect within five years.

The following is a rundown of where these proposals stood, one year later:

1973 Convention. The Convention, aimed primarily at limiting "willful" discharge of oil into the sea through normal tanker operations, has been ratified only by three small countries. It was submitted to the Senate March 22 of last year, but no action has been taken to date.

New International Conference. Substantial developments occurred in February when 62 nations reached agreement in London on recommendations for tightened construction standards for both new and existing tankers. The standards were intended to minimize

pollution from accidents as well as normal operations. (For details, see other sections of this report.) Shipping nations were encouraged to bring the standards into force individually as a spur to international ratification.

Oil Spill Liability Legislation. So-called "superfund" bills have moved slowly on Capitol Hill. The House passed a bill last September establishing a fund of up to \$200 million, financed by a 3-cent per barrel tax on all oil moved in U.S. waters, as a backup source of funding for oil spill cleanup if the parties responsible cannot be quickly located, or if the cleanup costs exceed the ship owner's legal liability. A similar bill was approved by the Senate Commerce Committee in September. Action in this area is complicated by the troublesome issue of pre-eminence of the Federal Government over the coastal states. Tanker operators want a federal law with standards that apply uniformly wherever their ships travel. A number of states want to impose their own standards and penalties.

Safety Information System and Tanker Boarding. President Carter instructed the Coast Guard to "board and examine each foreign flag tanker calling at American ports at least once a year and more often if necessary." This action would "insure that the ship meets all safety and environmental protection regulations." According to Coast Guard sources, the boarding requirements are being met, and information obtained from the

Tanker Rules At a Glance

The chart at right shows how the new tanker standards would apply, as proposed by the Inter-Governmental Maritime Consultative Agency (IMCO) for international shipping, and by the U.S. Coast Guard for foreign-flag ships entering U.S. waters.

The proposals agreed to by IMCO in February were incorporated into two protocols, one to the Safety of Life at Sea Convention (SOLAS '74) and the other to the Convention for the Prevention of Pollution from Ships (MARPOL '73). IMCO's projected target date for entry into force of the SOLAS agreement is June, 1979. As of April, 12 of the requisite 15 nations, with 49 percent of the world's tonnage, had ratified the agreement. The target date for the 1973 MARPOL agreement to become operative is June, 1981. Only three small nations had ratified this agreement as of April.

Following is an explanation of terms used in the chart:

Crude Oil Washing (COW): System of washing on crude carriers using cargo oil under pressure to remove sludge and other residue left in cargo tanks during discharge of cargo.

Clean Ballast Tanks (CBT): Regular cargo tanks reserved for exclusive use in carrying seawater ballast.

Inert Gas Systems (IGS): Systems for putting non-flammable gas—in most cases spent flue gas from ship's boilers—into cargo tanks to displace volatile gas/air mix left in the tanks when cargo is discharged. The purpose is to reduce possibility of explosion from electrostatic discharges during tank washing and cargo handling.

Other requirements: These include backup radar, backup steering and collision avoidance equipment. The latter would process radar information, alert crew when dangerous situations arise, and give information for maneuvering to avoid the danger.

boardings is being fed into the Marine Safety Information System (MSIS). The system keeps track of accident and pollution records of all ships, U.S. and foreign, but since over 90 percent of the United States' imported oil arrives in foreign-flag tankers, the chief objective is to get a handle on the foreign ships.

MSIS is actually a conglomeration and extension of existing information systems. It was put together over the past summer and partially put into operation on September 8. Since last December, all ports have been able to use the system.

MSIS provides information on each ship's safety and construction features, as well as historical data on its pollution incidents, casualties and violations. In April, the Coast Guard issued proposed rules requiring tankers

20,000 DWT and over entering U.S. waters to supply names of owners, shareholders and all previous names borne by the vessel. This data would be added to the MSIS files.

Crew Standards and Training. The House Merchant Marine and Fisheries Committee's Ad Hoc Select Subcommittee on Maritime Education and Training began oversight hearings on the subject in February. Chairman Studds, in his opening statement, said "there is no federal policy" in this area.

The Inter-Governmental Marine Consultative Organization (IMCO) will meet in June to develop improved international standards for crew training. This is one of a number of areas that have traditionally been left to the responsibility of "flag" states—countries under whose flags the ships are registered—

resulting in widespread criticism.

Response to Oil Pollution Emergencies. The Coast Guard currently has three pollution Strike Teams, consisting of about 25 persons each, located in New Jersey, Mississippi and California. The agency is considering plans for augmenting the teams, and is also preparing an inventory of pollution response equipment for inclusion in the MSIS data files.

Regulatory Action. The Coast Guard April 20 gave notice of intention to institute new construction and operational standards for ships entering U.S. waters. The proposals follow exactly the standards agreed to at the February IMCO meeting, but include firm compliance dates as opposed to dependence on international ratification. (See chart)

PROPOSED TANKER SAFETY & CONSTRUCTION STANDARDS

Type of Ship	Requirement	Would Become Mandatory	
		International (per IMCO proposals)	Foreign-Flag Ships Entering U.S. Ports (per April Coast Guard proposals)
NEW SHIPS			
Ships delivered between Jan. 1980 and June 1982 70,000 DWT & over.	Segregated ballast tanks	On entry into force of MARPOL '73	On delivery of ship
Ships contracted after June 1, 1979 or delivered after June 1, 1982. Crude carriers 20,000 DWT & over; product carriers 30,000 DWT & over.	Segregated ballast tanks/protectively located	On entry into force of MARPOL '73 and 1978 protocol	On delivery of ship
Crude carriers only, 20,000 DWT & over.	Crude oil washing	On entry into force of MARPOL '73 and 1978 protocol	On delivery of ship
All new ships 20,000 DWT & over.	Inert gas systems	On entry into force of MARPOL '73 and 1978 protocol	On delivery of ship
All new ships 10,000 GT & over.	Backup radar Collision avoidance equipment* Backup steering	On entry into force of SOLAS '74 and 1978 protocol	On delivery of ship
EXISTING SHIPS			
Crude carriers 40,000 DWT & over.	Segregated ballast tanks OR clean ballast tanks OR crude oil washing	On entry into force of MARPOL '73 and 1978 protocol (CBT option lapses after two years for ships 70,000 DWT & over and after four years for ships between 40,000-70,000 DWT)	June, 1981
Product carriers 40,000 DWT & over.	Segregated ballast tanks OR clean ballast tanks	On entry into force of MARPOL '73 and 1978 protocol	June, 1981
Crude & product carriers 70,000 DWT & over.	Inert gas systems	Two years after entry into force of SOLAS '74 and 1978 protocol	June, 1981
Crude & product carriers between 40,000-70,000 DWT & crude carriers 20,000 DWT & over using crude oil washing	Inert gas systems	Four years after entry into force of SOLAS '74 and 1978 protocol	June, 1983
All existing ships 10,000 GT & over.	Backup radar Collision avoidance equipment* Backup steering	Entry into force of SOLAS '74 and 1978 protocol Two years after entry into force of SOLAS '74 and 1978 protocol	June 1979 June 1981
ALL SHIPS	Monitor, control & automatic recording systems for at-sea discharges; slop tanks adequate to hold oil in excess of permissible discharge limits	Three years after entry into force of MARPOL '73	No requirement

*Implementation dates dependent on development of agreed performance standards.

Some Reflections on IMCO...

OWNING an oiltanker these days is something like owning the family car. All kinds of present and future regulations are on the books setting forth safety and anti-pollution standards. But chances are, if your car doesn't match up to all of these requirements, you won't have to scrap it, and you won't go to jail.

Much the same has been true for the tanker owner, at least until now. The 1973 IMCO Convention offers a hope to the world of completely eliminating "willful and intentional pollution of the seas by oil" by the "end of the present decade."

But the hope dims on examination of the fine print, and formal actions to date. For one thing, the 1973 IMCO standards, as of this moment, have no legal force. The Convention has yet to be ratified by any of the major shipping nations, including the United States. Signatures of 15 states representing half the world's shipping tonnage are needed to bring the Convention into force internationally.

So far, ratifications have come from Kenya, Tunisia and Jordan. Until such countries as Liberia (with 17 percent of the tonnage registered under its flag) or Japan (with 13 percent) or both, give their consent, none of the 1973 IMCO requirements, nor any of the amendments agreed to in February, will have force of law.

Even if ratified, the Convention will not have an immediate blanket effect throughout the world's sea lanes. One requirement agreed to in 1973 was that new large supertankers must have segregated tanks for ballast water. But "new" was defined as tankers delivered after Dec. 31, 1979. This February, the 1,082-foot, 228,000 DWT supertanker *Scheldex* was christened in Amsterdam. The ship was built without segregated ballast tanks. Presumably it will be plying the seas, lawfully under IMCO's own terms, long after the end of the present decade.

Ironically, Dutch shipping executive J. A. Reus, whose company built the *Scheldex* without segregated ballast tanks, told his audience at the

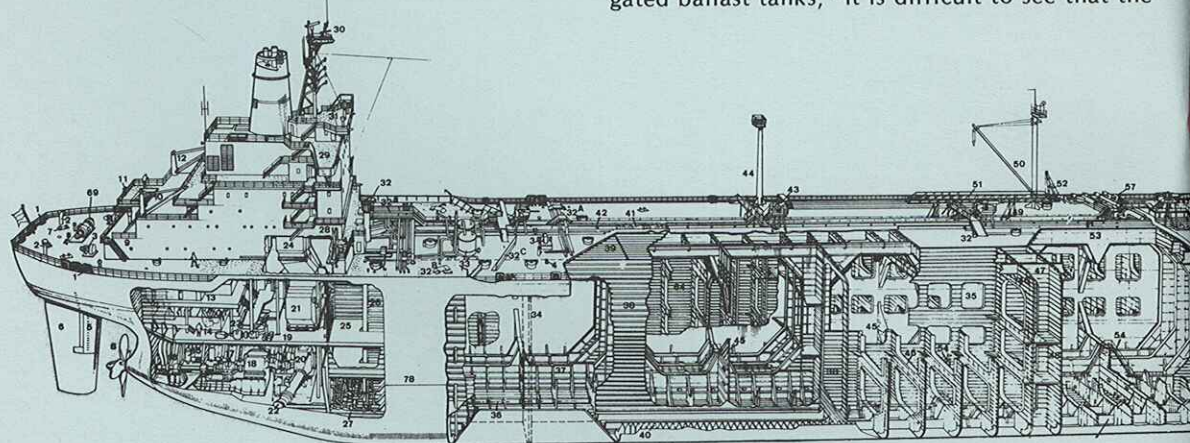
christening that such tanks should be required on all ships by international regulation. The retrofitting would give the world's depressed shipyards a much needed boost; a number of ships would be forced into the scrapyards, eliminating overtonnage in the tanker market; and the seas would be significantly cleaner, Reus said. It would have cost his company 1.6 million guilders, and resulted in loss of 18 percent of the cargo space, had they installed the tanks voluntarily, he added.

Another requirement of the 1973 Convention is for shipboard oil discharge monitoring and control systems and adequate "slop tank" arrangements, to insure that residues from tank cleaning and ballast operations will be retained on board and deposited ashore, rather than spewed out at sea on a dark night. The systems provide a permanent record of discharges, which can be inspected in port. But IMCO did not make its monitoring and slop tank requirements effective for existing ships until three years after the Convention enters force. That would mean 1984 under the most optimistic present ratification projections. The U.S. Coast Guard makes no attempt to advance this date in its planned new rules for ships entering U.S. waters.

Despite the goal of "complete elimination" of willful pollution, IMCO stood fast this February against mandatory segregated ballast for existing tankers. The consensus was that such a measure was too expensive and not essential for avoiding ocean pollution.

A contrasting view was presented to IMCO in 1976 in a joint study by Norway, Greece and Italy — countries with idle tankers that admittedly stand to gain from tough measures that would force some existing ships off the seas.

The three-nation study pointed out that because of the current glut of tanker capacity, there would be far fewer new ships built than the IMCO conferees had anticipated in 1973. Unless INCO supplemented its 1973 convention with further measures such as retrofitting existing ships with segregated ballast tanks, "it is difficult to see that the



CUTAWAY VIEW of single-skin Very Large Crude Carrier (VLCC), showing cargo tank arrangement. Large number of tanks helps hold down oil outflow in accidents, since, normally, only some of the tanks are ruptured.

...Real Progress or False Hopes?

pollution of the seas can be effectively controlled for many years to come," the study said.

For most ships, the work of installing segregated tanks would take from a few days to a month, would cost \$1-3 million dollars, and would cut cargo capacity by 10-20 percent; overall, the measure would add about 3/10 of a percent to the pump price of gasoline in Europe. The result, the report concluded, would be "an internationally-accepted higher anti-pollution standard of the world tanker fleet."

The report pointed out that the 1972 Stockholm Conference on the Human Environment "had among its conclusions that people are now prepared to pay to preserve and protect the world environment, recognizing that in the long term their very existence is dependent on introducing measures to achieve these objectives." (Most analyses of ship refitting costs cover only the cost of doing the job — not the potential liability cost of not doing the job. What is a duck worth? Or a French fishery?)

IMCO also stood fast this February against mandatory double bottoms as a mandatory requirement for new ships. As a substitute, it required protective location of ballast tanks. But for the largest supertankers the protective location formula could work out to coverage of only 20 percent of the hull area. How do ship designers decide which 20 percent of the hull is most likely to benefit from protection? IMCO admitted that current accident data was insufficient to give guidance and a study was ordered.

Despite some of the apparent shortcomings, the February compromises are seen, even by environmentalists, as important steps forward.

Intensive application of crude oil washing will lessen not only the pollution from ballast water, but from normal tank cleaning preparatory to changing cargoes or drydocking.

"Protectively located" segregated ballast tanks in ships of the future could lessen — to some degree — the incidence of spills from side collisions as well as groundings.

Delayed application of many of the new standards is necessary for orderly implementation of necessary engineering and construction changes in some 2,000 ships (270 of them under the U.S. flag) ultimately affected by the agreements.

And with oil now worth some \$90 a ton, economics alone will induce tanker operators to take the steps necessary to keep even small portions of cargo from going into the sea.

Or so the reasoning goes.

Soon after the *Amoco Cadiz* smashed up on the rocks off Brittany, a short item appeared in American newspapers, reporting the grounding of a Norwegian ore/bulk/oil carrier (These multipurpose ships, known as OBOs, are built with partial double bottoms.):

NEW ORLEANS, March 22 — (AP) — An 865-foot Norwegian tanker carrying 17 million gallons of crude oil was aground and under serious stress last night near the mouth of the Mississippi River, the Coast Guard said.

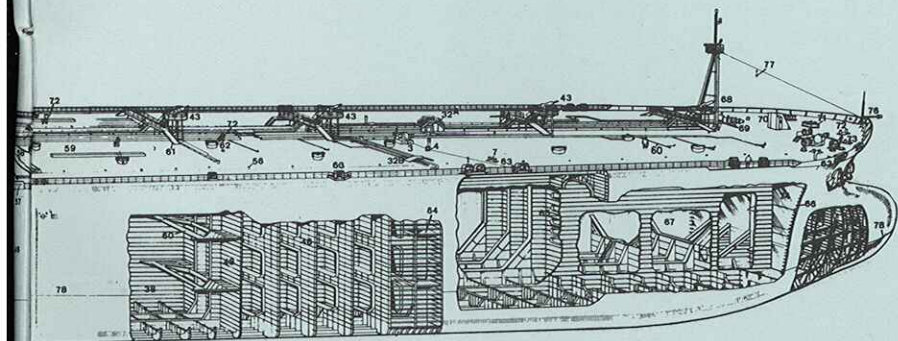
The ship, the *Bjorghav*, took on an estimated 750 tons of water through a gash in its outer hull, the Coast Guard said. However, the inner hull containing the oil was not punctured, a spokesman said.

NEW ORLEANS, March 23 — (AP) — The 865-foot Norwegian tanker *Bjorghav*, which ran aground in the Mississippi River, was refloated today without spilling a drop of its 17.2 million gallon load of crude oil

In light of the *Amoco Cadiz* disaster, will the public be content to wait until June 1981 for mandatory imposition of steering gear backup systems on existing tankers, as IMCO — and the U.S. Coast Guard — propose?*

And in light of the refreshing item from New Orleans, should the public now be asked to forego double bottoms as a requirement for tankers of the future entering U.S. waters?

*Actually, the *Amoco Cadiz* was said to have fully redundant steering gear in compliance with future IMCO standards. The first question to be studied by a Liberian-appointed Board of Inquiry meeting in London in May is why the steering failed. The single-skin ship was built in 1974.



Safer Ships: Yes or No?

EVER since publication of the Noel Mostert book, "Supership," oil companies have found themselves fending off public criticism over certain construction characteristics of large oil tankers.

Features sought by environmentalists — double bottoms or full double hulls, twin propellers, twin boilers, bow thrusters*, and segregated ballast are common enough in dry cargo and passenger ships. Why the operator resistance to installing them in tankers?

With respect to double bottoms and segregated ballast, part of the answer lies in the nature of the cargo. Unlike many dry cargoes, oil is light in relation to water, and can be stowed in practically every nook and cranny of the ship without sending it to the bottom. It is offloaded by pumps, so generally there is no need for smooth-sided cargo holds with flat bottoms, as is the case with much dry cargo.

So the typical large oil tanker is built as a giant catacomb of tank compartments, with framing members exposed and the skin of the ship serving also as the outside container for the cargo. Any break in the skin causes some loss of oil.

By omitting cargo tank floors and separate compartments for ballast water, tanker operators not only save several million dollars in construction costs but also avoid a penalty of unusable space every time the ship sails with cargo.

Some of the major oil companies have a put up stronger resistance to double bottoms for years.

A booklet, "Tanker Double Bottoms: Yes or No?," published in 1974 by the American Institute of Merchant Shipping (AIMS) contended that ships with double bottoms were actually likely to cause more pollution in event of grounding than ships without them.

The argument advanced was that rupture of a double bottom hull causes the protective space beneath the cargo tank to fill with water, making the ship settle more firmly on the bottom and thus inhibiting salvage. On the other hand, with a single skin tanker, a rupture releases some oil, but only to the point where the weight of the oil left in the cargo tank equalizes the pressure of the surrounding seawater. The tanker, thus lightened of a small amount of cargo, rises in the water, facilitating rapid salvage. The argument was pressed

so persuasively at the 1973 IMCO meeting that chief U.S. delegate Russell Train repeated it at subsequent Senate hearings. The AIMS booklet conceded some operational advantages for double bottoms, but only for "small 'drug store' tankers and specialty ships" making short coastal voyages.

A different view on double bottoms was taken in a 1971 study* by three associate members of the Society of Naval Architects and Marine Engineers. The three contended that even in a severe grounding where the rupture reached a cargo tank, a double bottom "would buy three extremely valuable items" — containment of the spill to fewer tanks, greater chance for survivability of the ship, and more time to deal with the spill problem even if ultimate breakup of the ship occurs.

A recent study by Lt. Cmdr. James C. Card of the Coast Guard concluded that minimal double bottoms (affording about six feet of protective space under the cargo tanks) would have prevented oil spillage in 27 of 30 tanker groundings that occurred in U.S. waters between January 1969 and April 1973. And some tanker experts see another side to the coin of a single-skinned ship helping to free itself in a grounding. Admittedly, loss of oil can cause buoyancy of part of the ship, but as any sailor knows, unplanned buoyancy in the wrong place can stress the hull and cause the ship to break in two.

Today, 13 new San Clemente class tankers are in operation by U.S. flag companies, all with double bottoms. Built with Maritime Administration subsidies, the 90,000-tonners are serving in the Alaska and Mideast trades and are well out of the class of small "drug store" ships.

And Mobil Oil Co. now has double bottoms in six of its 19 large supertankers over 200,000 DWT, as well as seven of its smaller product carriers in the 30,000 DWT range.

A Mobil spokesman told *Ocean World* the company had achieved "significant operational benefits" — in cargo drainage, tank washing and corrosion control — with the double bottom ships and was "pleased with the safety characteristics."

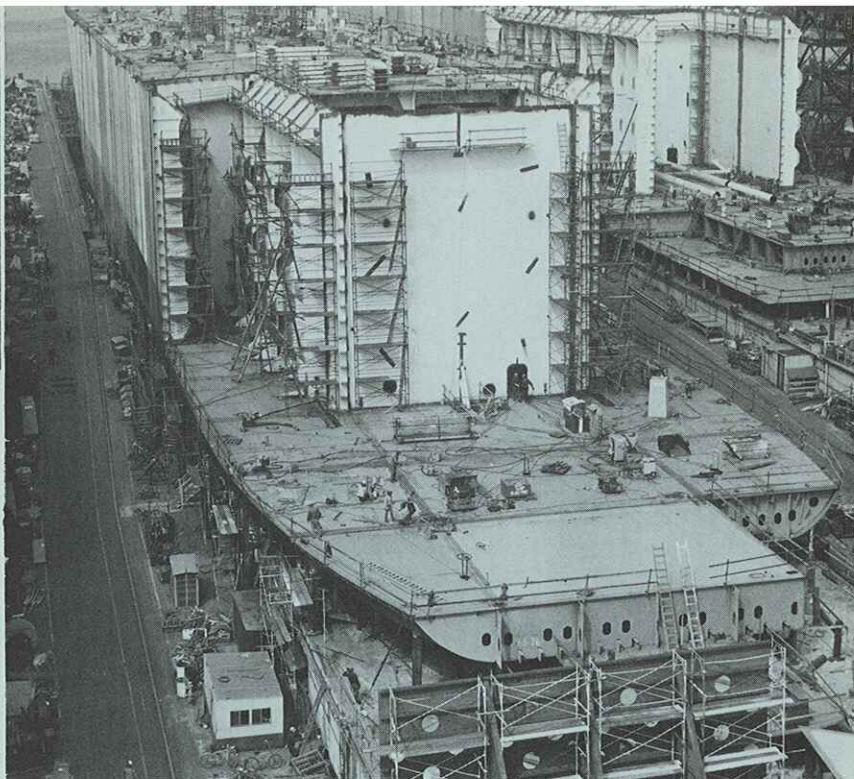
He made clear, however, that Mobil took the position that use of double bottoms should be left to the discretion of each owner, depending on operational conditions, and "should not be made part of mandatory requirements."

*Tankers and the Ecology, a paper presented at the SNAME 1971 annual meeting by Joseph D. Porricelli, Virgil F. Keith and Richard L. Storch.

*Small bow propellers for maneuvering in tight quarters.



A DOUBLE BOTTOM San Clemente class tanker is shown under construction at the National Steel and Shipbuilding Co. yards in San Diego. Above, one of the ships on sea trails.



William Gray, senior advisor to Exxon International Co. and head of the Oil Companies international Marine Forum, told *Ocean World* that Exxon — operator of the world's largest tanker fleet — has no double bottom oil tankers and "doesn't want them." Gray said Exxon studied double bottom proposals in the late 1960s and concluded that gas could collect in the bottom compartments, endangering ship and crew. He said the problem comes up when men are sent into the "long tunnels" to make inspections. Gray cited the case of a hull inspection on a liquid petroleum gas ship where three men walked into a pocket of inert gas and were asphyxiated.

"People say our position is a smokescreen, but it's not the cost that turns us away from double bottoms. It's crew safety, and also the salvage factor."

Clarence L. French, Jr., president of National Steel and Shipbuilding Co. of San Diego, which built the San Clemente class tankers, said the additional cost of including double bottoms in these ships turned out to be 2 percent, with only a 1,000-ton loss of cargo capacity.

French's yard is now turning out a 190,000-ton tanker with double bottoms which it calls the San Diego class. Buyers of the first four ships include Atlantic Richfield and Shell. French said his designers had eliminated the "long tunnel" problem by making a half dozen separate bottom compartments along the length of the hull, ac-

cessed by two "towers" at diagonally opposite corners of each compartment. The towers facilitate easy ventilation, so a man can go down and look up at the bottom of the cargo tanks when the ship is fully loaded, French said.

A full double-hull ship has been developed by Sun Shipbuilding of Chester, Pa. The first of the 120,000 tonners is being used in the Alaska trade by Standard Oil of Ohio and two others are being completed for the same company. The ship, dubbed the "ecology class" by Sun, has 7½ feet of protective space on each side and 9 feet under the cargo tanks. Half of the protective side tanks can be used for cargo at the owner's option, according to Sun public relations director John Jorden. The remainder of the tanks are reserved for ballast water when the ship is running empty.

A Sun engineer indicated that the company had had some qualms about developing the ship. "The protective features do cost more, and if your competitor is not compelled to have them too, then you can be operating at a competitive disadvantage."

Will the move toward double bottoms now fade as a result of the Carter Administration's back-down at the February IMCO meeting? Not necessarily. Environmentalist groups would still like to see them made mandatory for new ships flying the U.S. flag. And tanker operators themselves are taking a hard look at their position on all safety options in light of the chilling costs of the *Amoco Cadiz* wreck.

CALENDAR

1978

May 18-19. The Urban Coast and Energy Alternatives, Princeton, New Jersey. Contact: The Princeton University Conference, Princeton Univ., 5 Ivy Lane, Princeton, NJ 08540; (609) 452-3369.

May 18-19. UNOIS Annual Meeting, Washington, D.C. Contact: Thomas Stetson, University-National Oceanographic Laboratory System Office, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543; (617) 548-1400, ext. 352.

May 22-23. Barrier Beach Management Workshop, Provincetown, Massachusetts. Contact: Extension Sea Grant Advisory Program, P.O. Box 343, East Wareham, MA 02538; (617) 253-3461.

May 22-23. Wildlife Law and Policy conference, Washington, D.C. Contact: Wildlife Law & Policy, Environmental Law Institute, 1346 Connecticut Ave. NW, Suite 600, Washington, DC 20036; (202) 452-9600.

May 31. Second Annual Doherty Lecture in Oceans Policy (by Ambassador Elliot Richardson), Washington, DC. Sponsor: Center for Oceans Law and Policy. Contact: Harrison Management, 1901 N. Moore St., Suite 805, Arlington, VA 22209; (703) 522-2727.

June 1-2. Third National Conference on Interagency Energy/Environment R&D Program, Washington, D.C. Contact: Kathleen E. Dixon, Automation Industries, Inc., Vitro Laboratories Div. (4-2109), 1400 Georgia Ave., Silver Spring, MD 20910; (301) 871-4711.

June 8-9. American Intl. Conference on Tanker Safety and Pollution Prevention, Washington, D.C. Contact: Harold Wilson, Coastal & Offshore Plant Systems, Inc., 1000 Connecticut Ave. NW, Washington, DC 20036; (202) 452-8787.

June 12-14. Natl. Assn. of Marine Services Annual Convention, Fairmont Hotel, San Francisco. Contact: C. Willman Brown, (301) 924-2316.

June 14-17. Conference on Assessment of Ecological Impacts of Oil Spills, Keystone, Colorado. Contact: American Inst. of Biological Sciences, Special Science Programs, 1401 Wilson Blvd., Arlington, VA 22209; (703) 527-6776.

June 19-21. Formulating Marine Policy: Limitations to Rational Decision-Making conference, Narragansett, Rhode Island. Contact: Center for Ocean Management Studies, University of Rhode Island, Kingston, RI 02881; (401) 789-1374.

June 24-15 Aug. Tall Ships Pacific '78, ocean race, Honolulu-Victoria-Vancouver-Seattle-San Francisco-Long Beach. Contact—Tall Ships '78, American Sail Training Assn., Eisenhower House, Fort Adams State Park, Newport, RI 02842; (401) 846-1775.

June 26-30. International Whaling Commission, annual meeting, Cambridge, England. (IWC Scientific Committee meets June 5-21, Cambridge) Contact: Intl. Whaling Commission, The Red House, Station Rd., Histon, Cambridge CB4 4NP, England.

July 23-27. Intl. Symposium on Predator-Prey Systems in Fish Communities, Atlanta, Georgia. Contact: Richard Stroud, Sport Fishing Institute, 608 13th Street NW, Suite 801, Washington, DC 20005; (202) 737-0668.

August 9-11. Eighth Natl. Marine Education Conference, Olympia, Washington. Contact: Natl. Marine Education Assn., 546-B Presidio Blvd., San Francisco, CA 94129; (415) 561-3221.

August 21-15. American Fisheries Society Annual Meeting, Kingston, Rhode Island. Contact: Carl R. Sullivan, 5410 Grosvenor Lane, Bethesda, MD 20014; (202) 897-8616.

August 28-31. 1978 Annual Meeting of the American Section of the Intl. Solar Energy Society, Denver. Contact: American Section, Intl. Solar Energy Society, Inc., 300 State Road 401, Cape Canaveral, FL 32920.

Sept. 6-8. Oceans '78 annual meeting of Marine Technology Society and Inst. of Electrical & Electronics Engineers' Council on Oceanic Engineering, Washington, D.C. Contact: Oceans '78, MTS-IEEE, Suite 412, 1730 M St. NW, Washington, DC 20036; (202) 659-3251.

Sept. 24-28. American Assn. of Port Authorities Annual Convention, Nassau, Bahamas. Contact: AAPA, 1612 K St., NW, Washington, D.C. 20006.

Oct. 9-12. 11th Annual Sea Grant Assn. Conference, Portsmouth, New Hampshire. Contact: Sea Grant Assn., 3300 Whitehaven St. NW, Washington, DC 20235; (202) 634-4033.

Oct. 10-12. Intl. Symposium on Interaction of Marine Geodesy and Ocean Dynamics, Miami (Virginia Key), Florida. Contact: George A. Maul, NOAA-AOML, 15 Rickenbacker Causeway, Miami, FL 33149.

Nov. 4. 7th annual Inward to the Sea, underwater film festival, Washington, DC. Contact: Inward to the Sea, P.O. Box 41010, Washington, DC 20014; (202) 347-0206.

Nov. 9-12. IQ-TEN, sport diving conference, Anaheim, California. Contact: Jeanne Bear Sleeper, Natl. Assn. of Underwater Instructors, P.O. Box 630, Colton, CA 92324; (714) 783-1862.

1979

March 19-22. 1979 Oil Spill Conference, Los Angeles. Sponsors: American Petroleum Institute, Environmental Protection Agency, U.S. Coast Guard. Contact: Oil Spill Conference, Suite 700, 1629 K Street NW, Washington, DC 20006; (202) 296-7262.

Commentary

As an energy-hungry society, we will continue to depend on petroleum for as long as supplies last or until alternative energy sources become available and economically competitive — decades, perhaps centuries into the future. This continued, probably growing, use of petroleum carries with it the threat of marine oil pollution throughout our lifetimes.

Does oil pollution threaten catastrophe, or is it a minor perturbation, one of the many stresses man imposes on the marine environment? Oil-soaked birds — unable to fly, dead or dying — are a dramatic and deplorable example of the damage an oil spill can do in coastal waters. But is this a fair gauge of the problem? Could those who tell us that fishing is great around offshore oil rigs equally speak the truth? Only sincere and unbiased scientific investigation of the effects of oil in the marine environment can lead to proper evaluation. Social, economic, and political considerations will be major determinants of regulations to protect our environment, and ultimately of how our civilization may develop. But let the decisions be made with full scientific appreciation of the probable effects. . . .

From a standing start — one could say a late start — a decade or two ago, scientific institutions have made good progress in investigating how petroleum gets into coastal waters, where it goes, and what effects it may have along the way. Much of the work has been done in the last five years. . . .

Where does this oil — an estimated 6 million tons per year worldwide — come from? Tanker accidents and oil-well blow-outs raise the most concern and receive the greatest publicity, but combined they account for only about 4 percent of the total, according to a study published in 1975 by the National Academy of Sciences. A much larger share, 30 percent, results from transportation of oil and related activities. The largest share comes from man's terrestrial operations (44%), such as discharges of municipal sewage and wastes from coastal industries, and including a large amount carried by the rivers into which we dump

Dr. Ketchum, Senior Scientist Emeritus, formerly Associate Director of the Woods Hole (Mass.) Oceanographic Institution, has done considerable research in the area of marine pollution. This commentary is reprinted with permission from the Fall, 1977 issue of *Oceanus*, the Woods Hole magazine.

wastes to be carried, eventually, to the sea. Offshore oil production, also of great concern to many, releases only about a third of 1 percent of the total oil reaching the oceans; a greater hazard is involved in getting this oil ashore. The remaining 22 percent reaches the sea via the atmosphere (about 10%), from oil seeps on the ocean bottom (about 10%), and from ship accidents not related to oil production. Oil pollution from most of these sources could be reduced considerably by stricter regulations. But the chronic dribbling of petroleum wastes down rivers and bays and into the sea is as difficult to control as it is to measure; these discharges constitute a diffuse source more difficult to assess and study than a localized and intense oil spill.

What happens to petroleum after it enters the sea depends on variables almost as complex as the substance itself: the types of oil, the dosage, the physical nature of the locale, the season, the weather, the types of organisms present. Oil pathways in the ocean include evaporation, solution, emulsification, adsorption onto particles, assimilation into digestive systems, deposition in sediments or weathering into tar balls on the surface. . . .

The effects of oil on marine life are beginning to yield to analysis. Some organisms appear to live their lives unaffected. Others metabolize petroleum compounds. Still others cleanse themselves, at least partially, when removed to uniled areas. Some grow more slowly, or suffer reproductive or communicative impairment, or may develop tumors after prolonged exposure. And some, of course, die. Immediate mortality is in many instances measurable. What isn't yet, at least not in any general sense, is the long-term effect of oil on the marine environment. . . .

Long-term investigation — of the recovery of affected ecosystems, the sublethal effects of chronic exposure — requires a patient and flexible approach not always found among those hard pressed to make immediate, short-term decisions. Yet it is sorely needed, in this as in other instances where our demands press on the ability of the ecosystems to adjust. We cannot know what we are doing in the full and crucial sense without the difficult business of collecting data, testing theories, and keeping cool.

Bostwick H. Ketchum

Oil rolls from broken front
section of Amoco Cadiz.
Ship's mast can be seen at
lower left, only visible rem-
nant of sunken stern section.

