

DOUBLE SUPPLEMENT: THE GRAND CANYON OF THE COLORADO

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Giants That Move the World's Oil

SUPERSHIPS

By NOEL GROVE
SENIOR EDITORIAL STAFF

Photographs by MARTIN ROGERS

The bigger they come, the hotter the debates they fuel. Huge tankers such as the



THE LANTERNS OF Malaysian sampans winked around us like fireflies. Capt. Antonio Cacciuttolo stared at them from the night-blackened bridge of the *Afran Zodiac* and muttered, "Fishermen . . . they are supposed to stay out of the shipping lanes."

He wheeled and strode to the radar platform, where small craft flecked the screen in a green swarm. At the center of the screen was the *Zodiac*, an oil tanker as wide as a football field and nearly three fields long, moving through the swarm like a Goliath among gnats. The lanky captain wheeled

again and entered the chart room to check our current position—a matter of even greater concern.

An imminent collision with an errant sampan cannot be avoided by a vessel that requires more than a mile to stop, even at our half speed of eight knots. But we were entering the Strait of Malacca, where the broad and deep thoroughfares of the sea narrow to a shallow alley between Sumatra and the Malay Peninsula, a passage where navigational errors of ships are engraved on a granite seafloor.

The *Zodiac*, chartered by Gulf Oil, rode

Chevron Brussels cut oil-delivery costs but bring concern over giant oil spills.

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FRANK MUELLER-MAY, STERN





Islands under power, today's supertankers require pilots whose seafaring savvy is matched by their technological know-how. Shepherding a 1,040-by-164-foot colossus, the captain of the *Afran Zodiac*, en route to Korea with Kuwaiti crude oil, takes a bearing by squinting through an azimuth circle (left). The wake of the 121,000-ton *ARCO Fairbanks* (right) points back to tricky Valdez Narrows as the tanker makes a test run over the route where Alaska-pipeline oil is now shipped.

the waves like an iceberg. Sixty-eight feet of her ponderous belly hung beneath the surface, loaded with 70 million gallons of Kuwaiti crude—enough to produce a tank of gasoline for every car in Chicago.

In the two weeks since photographer Martin Rogers and I had boarded the ship in the Persian Gulf, I had witnessed the skillful seamanship of the 38-year-old boyish-faced captain. And yet, this night I could feel the quiet, professional concern as he drifted back to the wheelhouse to gaze out at the winking lantern lights.

"The sampans," I asked, reluctant to intrude upon his concentration, "aren't there patrol boats to keep them away?"

"Yes, but . . ." I sensed the shrug of acceptance beside me in the dark, "there are so many, and the fishing is good here."

Economic need. It explained the presence of both supership and sampan in an area where the margins of safety had grown thin. Just as the fishermen hungered for a good catch, the world hungers for petroleum. Gargantuan oil tankers have become the mobile pipelines that carry it from the oil-rich Middle East to the oil-hungry industrialized nations.

The mind gropes for superlatives, for comparisons to describe these superships. The largest of them, upended, would stand higher than the Empire State Building. The paint alone on the huge *Globtik Tokyo*

into the sea, I often used the deck of the *Afran Zodiac* as a jogging track. Once around the ship: nearly half a mile.

Tankermen rank vessel size not by length or weight of the ship or by its displacement but by deadweight tons, the total weight of cargo, stores, and fuel that the ships carry. The T-2 tankers of the 1940's were ships of 16,000 deadweight tons (dwt); *Afran Zodiac's* 16 cargo compartments hold 13 times more than that. Yet there are many modern tankers bigger than the *Zodiac*, whose 228,000 tons rank it as middle-sized among superships.

Lagging Oil Market Hobbles Fleet

I boarded tankers of many sizes in a ship-hopping, ocean-hopping exploration of these seagoing giants. In the worldwide tanker fleet of 4,200 vessels, superships over 200,000 tons number some 700, roughly 17 percent of the total. They move more than half the oil around the world.

Both at sea and ashore I talked with officers and crewmen, owners, fleet managers, and designers. I saw their pride as they talked of the huge vessels, the largest moving objects ever built by man. But I heard tales of concern as well. Roughly a fifth of the superships now sit idle, and the rest operate at reduced speed, as a result of a depressed oil market.

I also heard concern from those who fear the environmental consequences of super-





a massive spill, such as the wreck of the 229,000-ton *Amoco Cadiz* off the Brittany coast early in 1978, the effects are immediate and devastating. (See pages 124-135.) **Scientists disagree on the long-term effects of a large spill. But no one questions whether more will occur.** The U. S. now imports nearly half its oil. Western Europe imports 95 percent of its supply, Japan virtually every drop.*

Super Detour a Boon to Superships

The closing of the Suez Canal in 1967 assured the proliferation of giant tankers. When sunken ships littered the passage after the Arab-Israeli six-day war, westbound tankers from the Persian Gulf had to sail around Africa to reach their markets, a detour of 9,600 miles (map, following pages).

Much as a jumbo-sized soft-drink container may lower the price of a drink by replacing six small bottles, one jumbo ship can haul oil at lower cost than several small ones. Fuel costs do not increase in proportion to the size of the ship. A tanker of 32,000 tons burns nearly 75 tons of fuel a day, while one of half a million tons burns 330 tons. Hauling 15 times more oil, the larger ship uses less than five times the fuel.

Nor do tanker crews increase with size. I sailed on one ship of 75,000 tons that carried a crew of 47. The *Zodiac*, more than three times that tonnage, carried 36.

Lower costs, bigger volume—little wonder that tankers have ballooned beyond the Ancient Mariner's wildest nightmares.

"When people saw what money could be made, some went to oil companies and got commitments to haul oil before they owned a tanker," I was told by Capt. Ralph Maybourn in British Petroleum's 32-story Britannic House in London. "Then they went to a banker and said, 'Look, I've got the business, let's build a ship.' Some of those ships were paid off within a year or so."

In the early stages of growth, they were called "supertankers," but each generation dwarfed the last (pages 113-15). The name has been dropped by tankermen, who now usually refer to vessels between 200,000 and 300,000 tons as Very Large Crude Carriers

(VLCC's), and anything over 300,000 as Ultra Large Crude Carriers (ULCC's).

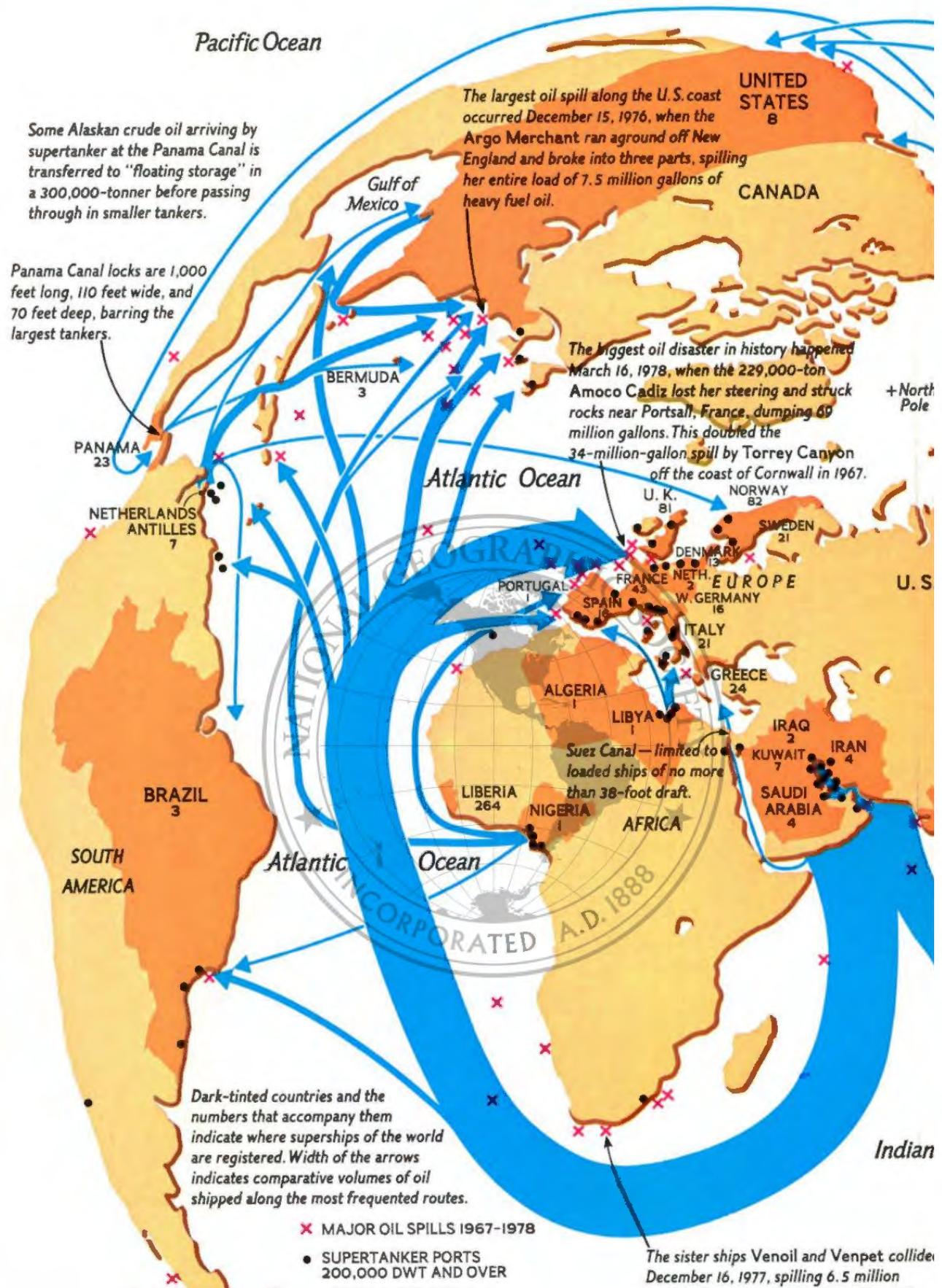
They may be the most international commercial enterprises ever devised. The *Zodiac*, for example, was built in Japan, owned by Americans, registered in Liberia, insured by a British firm, run by an Italian crew, and, when I sailed on her, carried Kuwaiti crude oil to a Korean port.

Few of the large ships, and none of the largest, have been built in the United States. Owners claim that construction costs can be more than halved in highly automated Japanese shipyards.

Economy often dictates the nationality of tanker crews as well, and the registry of the ship itself. By law, American-flag ships



A tanker's not a town, but crewmen can go to the movies, take a dip in a pool, or drop by for a checker game aboard the *Bel-lamyia* (above), world's largest ship at 541,000 deadweight tons. Crew and officers can bring their wives; one passes time on the bridge (facing page) while others





must carry American crews, whose wages reflect their country's standard of living. An Italian captain may earn \$20,000 a year, an American captain, \$60,000.

"The average cost of an American crew is about \$1.8 million a year," a fleet manager for a major oil company told me. "An Italian crew might cost about \$800,000, and we have Filipino crews at about \$400,000."

The repeated involvement of Liberian-registered ships in tanker accidents has raised public concern about the so-called "flags of convenience."

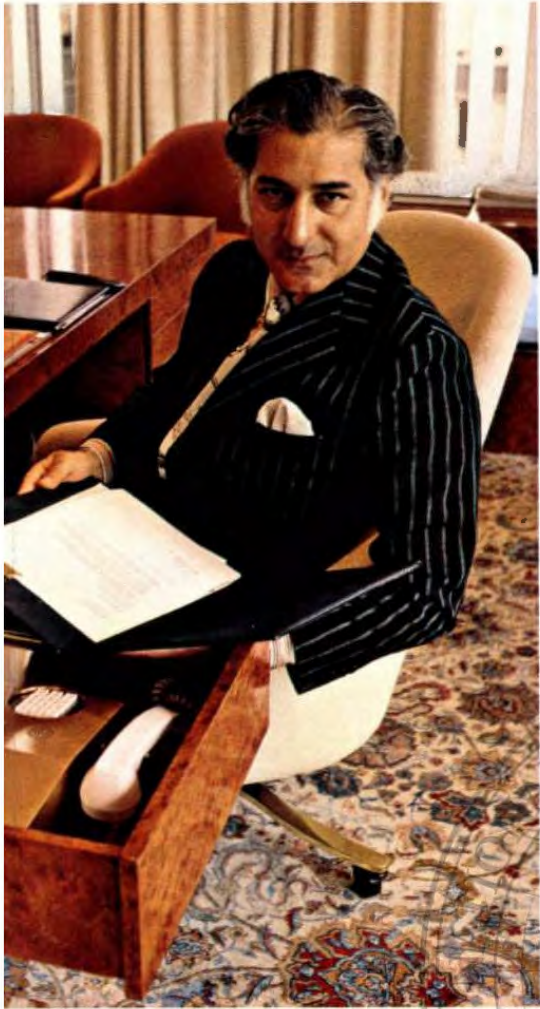
"By sheer numbers of ships registered, it is logical that many accidents involve Liberian tankers," explained Arthur McKenzie, who operates a tanker-casualty data service in New York City. "A quarter of the world's tankers and a third of the tonnage are Liberian-registered. But in percentage of accidents by fleet size, they are only slightly above the American and lower than the British. Furthermore, their percentage rate is improving."

"It's true that many substandard ships are drawn to Liberian registry," he added. "But so are some of the best. The reasons are crew flexibility and no income tax, not easier ship inspection, as many people think."

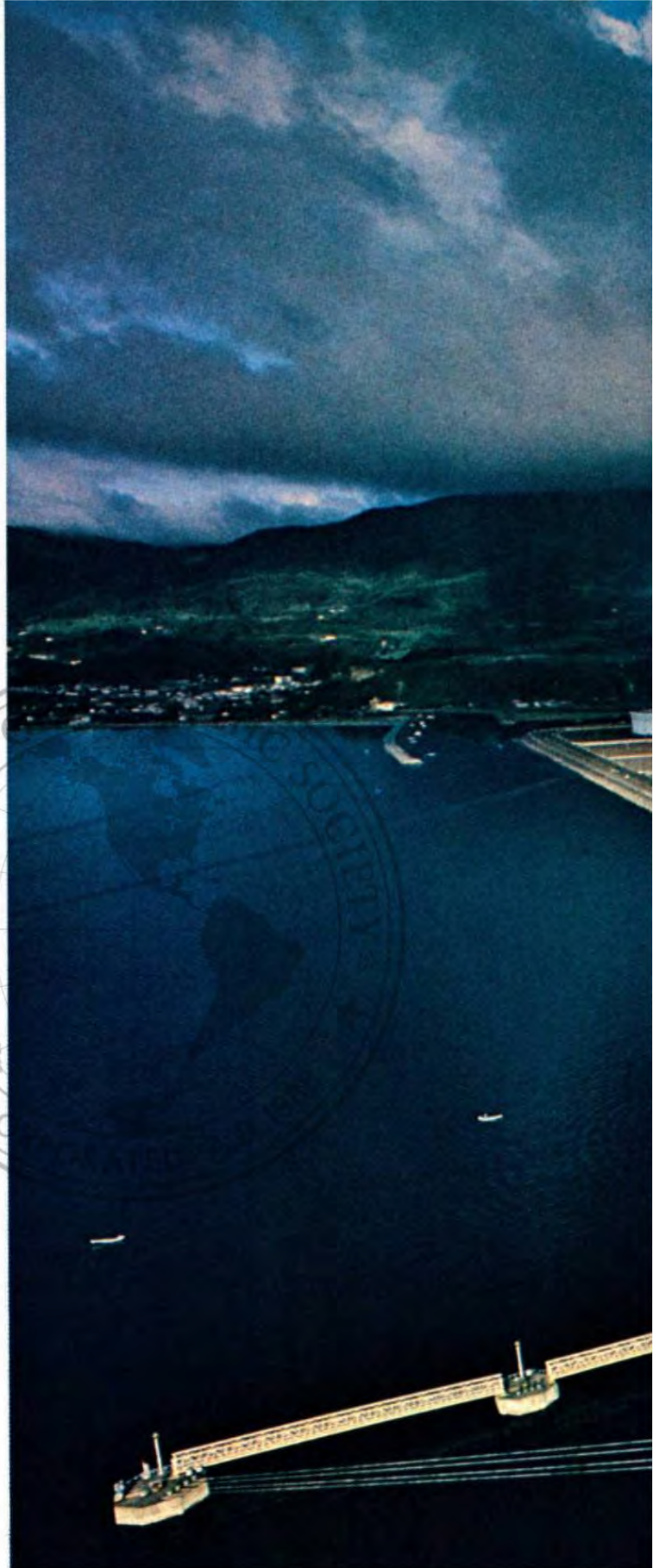
Tanker Crews See Mostly Sea

Boredom and loneliness, the by-products of confinement, are the enemies of crews on big tankers. Turnaround time at the end of a voyage lasts long enough for oil to be pumped in or out of the vessel, but rarely long enough for anyone to go ashore. The oil transfer may take place at a "sea island" of metal framework miles from land. Limited to deep water by their extreme draft—as much as 94 feet—the big tankers wander a seemingly shoreless ocean, floating habitats creating their own drinking water in 40-ton-a-day desalinators, processing their own sewage, conditioning interior air to suit changing latitudes, and taking on fresh stores by helicopter or launch.

For sea duty rivaling in length that of the old whalers, supership sailors need not endure cramped quarters and salt-pork rations. Single- or double-occupant cabins are



Floating lodes of black gold made super fortunes for transportation tycoons such as Ravi Tikko (above). The India-born shipping magnate is taking his biggest step yet: building the first nuclear tankers. Facing tough environmental obstacles and a current worldwide surplus of tankers, Tikko plans three 600,000-ton atomic ships, each costing 325 million dollars. His British firm owns four ships. Two are among the world's largest, including the 476,000-ton *Globtik Tokyo*, unloading into a tank farm at the Kiire, Japan, deepwater port (right). Since virtually all U. S. ports are too shallow for superships, loads are pumped into smaller ships in deep water. Environmental concern delayed plans for a U. S. superport in the Gulf of Mexico, now under construction.





ESSO ATLANTIC, 1977

At 509,000 tons the Esso Atlantic—together with her sister ship, the Esso Pacific—is among the world's five biggest ships. The 1,334-foot Japanese-built Esso Atlantic sails mainly from the Persian Gulf to ports in northern Europe and also lighters in the Gulf of Mexico.

MANHATTAN, 1962

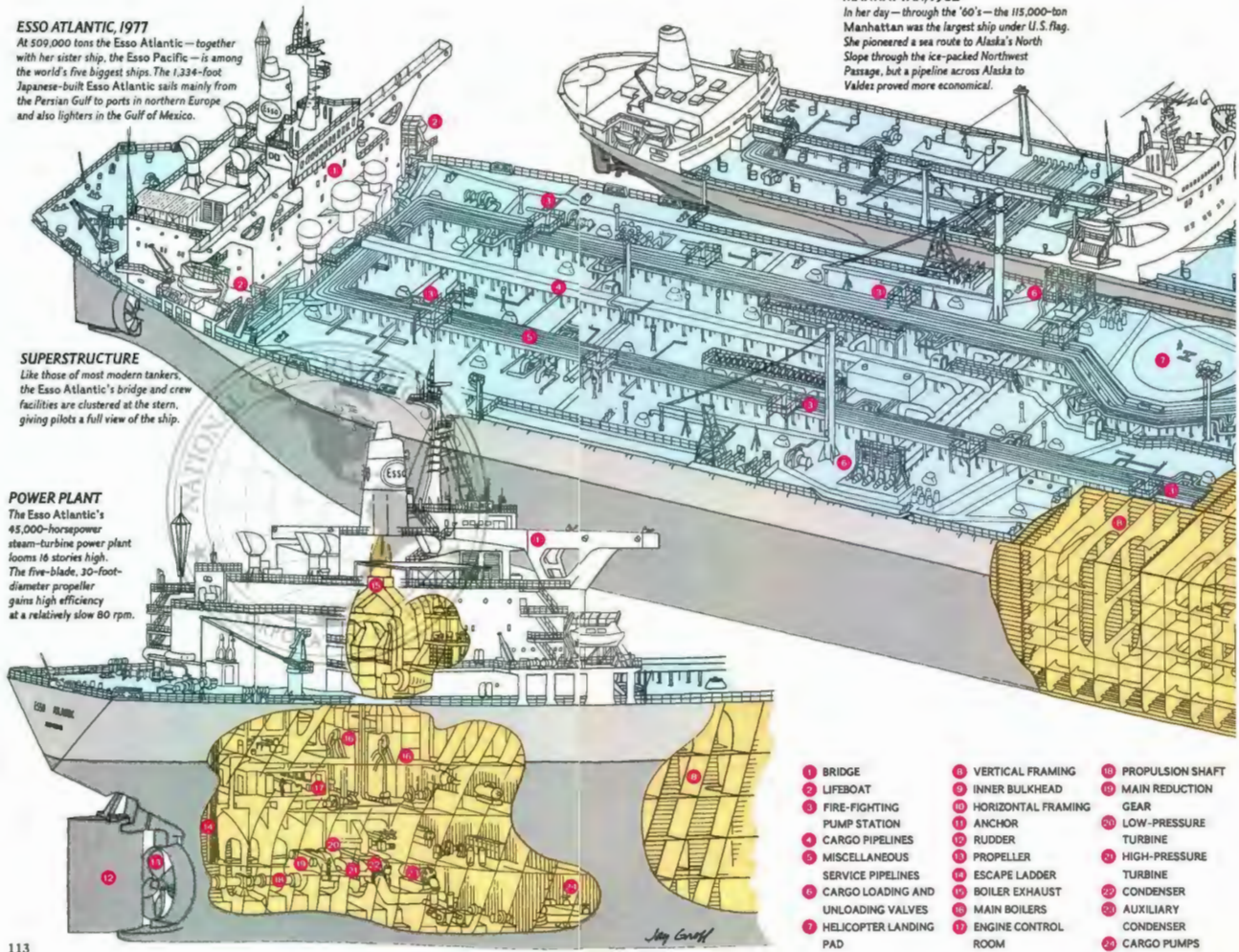
In her day—through the '60's—the 115,000-ton Manhattan was the largest ship under U.S. flag. She pioneered a sea route to Alaska's North Slope through the ice-packed Northwest Passage, but a pipeline across Alaska to Valdez proved more economical.

SUPERSTRUCTURE

Like those of most modern tankers, the Esso Atlantic's bridge and crew facilities are clustered at the stern, giving pilots a full view of the ship.

POWER PLANT

The Esso Atlantic's 45,000-horsepower steam-turbine power plant looms 16 stories high. The five-blade, 30-foot-diameter propeller gains high efficiency at a relatively slow 80 rpm.



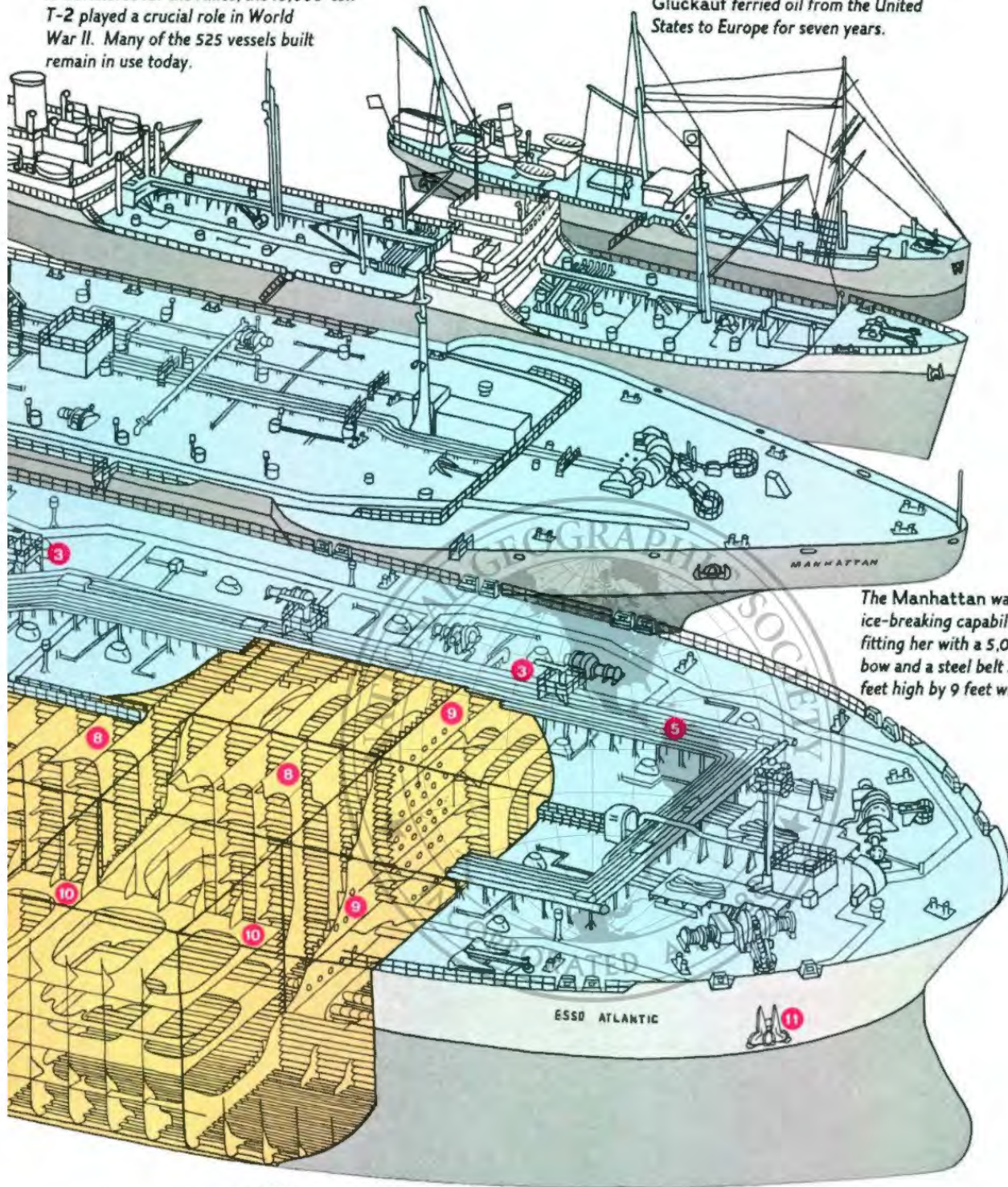
- | | | |
|-----------------------|----------------------|---------------------|
| 1 BRIDGE | 6 VERTICAL FRAMING | 16 PROPULSION SHAFT |
| 2 LIFEBOAT | 7 INNER BULKHEAD | 17 MAIN REDUCTION |
| 3 FIRE-FIGHTING | 8 HORIZONTAL FRAMING | 18 GEAR |
| 4 PUMP STATION | 9 ANCHOR | 19 LOW-PRESSURE |
| 5 CARGO PIPELINES | 10 RUDDER | 20 TURBINE |
| 6 MISCELLANEOUS | 11 PROPELLER | 21 HIGH-PRESSURE |
| 7 SERVICE PIPELINES | 12 ESCAPE LADDER | 22 TURBINE |
| 8 CARGO LOADING AND | 13 BOILER EXHAUST | 23 CONDENSER |
| 9 UNLOADING VALVES | 14 MAIN BOILERS | 24 AUXILIARY |
| 10 HELICOPTER LANDING | 15 ENGINE CONTROL | 25 CONDENSER |
| 11 PAD | 16 ROOM | 26 CARGO PUMPS |

T-2, 1945

A workhorse for the Allies, the 16,000-ton T-2 played a crucial role in World War II. Many of the 525 vessels built remain in use today.

GLUCKAUF, 1886

First prototype tanker, the 3,000-ton Gluckauf ferried oil from the United States to Europe for seven years.



The Manhattan was given ice-breaking capability by fitting her with a 5,000-ton bow and a steel belt 32 feet high by 9 feet wide.



The cargo space of the Esso Atlantic holds more than 17,000 times as much as this 9,000-gallon fuel truck.

EVOLUTION OF A GIANT

PAINTING BY JAY M. GROFF
RESEARCH BY GUMARS J. RUTINS
NATIONAL GEOGRAPHIC ART DIVISION



(Continued from page 109) typical evening on the *Zodiac* included pasta, asparagus soup, an entrée of beef *alla pizzaiola*, dessert of several excellent cheeses and fresh fruit. Beer if desired, coffee after. Martin Rogers and I sent our compliments to the chef one evening for his rich cream puffs. He emerged from the galley, round face crinkled in a huge smile: "*Grazie tanto, signori!*" More cream puffs followed. My daily jogs around the deck became imperative.

The comforts do not totally make up for the confinement. An Italian captain who had been at sea almost continuously for 11 months told me, "Nobody likes the big ships. Nobody but the owners."

On the bridge of the *Zodiac* one day an officer stared pensively over the long, wide deck, and said, "Did you ever drive a small, fast car, and feel you were a part of it? That's why I prefer a tanker of 50,000 tons."

The big tankers certainly need more room to maneuver. To make up for the ungainliness, they rely on sophisticated navigation, docking, and collision-avoidance systems. The last indicates speed and direction of moving obstacles and sounds an alarm whenever it computes a collision course.

The *Zodiac* chart room includes Loran C, Decca, and Omega navigational aids, which receive radio waves from transmitting stations scattered around the world to determine the ship's position. Officers also check the accuracy of modern technology by shooting the stars with an instrument predating Lord Nelson—the sextant.

Oil and Water Shouldn't Mix

I was on the starboard bridgewing when I first saw a slick of phlegmy, caramel-colored oil, a couple of ship lengths wide, floating on the gray-blue sea.

"That is nothing," said Captain Cacciuto, after the *Zodiac* had cut through the patch. "It is tan, which means it has been mixed with water. Real oil pollution is black; I have sailed through it for miles."

The tan color suggested that a ship had

washed its cargo tanks with seawater and disgorged the results. Sludge clinging inside a tank must be cleaned out after unloading, with a high-pressure stream of liquid. Today responsible tankers pump the washings to a slop tank, and allow oil and water to separate before pumping out the water. A more recent technique called crude-oil washing uses oil sprayed at high pressure to clean the emptied tanks. New ships will have segregated oil and ballast tanks. Nevertheless, **tank washing with water still contributes at least a sixth of the six million tons of all the oil that pollutes the oceans annually.**

Proposed Port Harbors Controversy

At Singapore the *Zodiac* coasted for a few minutes while a launch nudged against her to take us off. Our trip would have been longer aboard a bigger ship; tankers near half a million tons must bypass the Strait of Malacca and circumnavigate most of Indonesia to reach Japan.

That trip could be shortened if a proposed supertanker port and refinery center were built in the Palau Islands, a remote sprinkling of coral reefs and volcanic and limestone hills east of Mindanao. (See "Dazzling Corals of Palau," beginning on page 136.)

A battleground between Japanese and American troops in World War II, Palau has become the scene of an environmental confrontation. The reefs are a marine biologist's paradise, teeming with life that could be decimated by pollution, says Robert Owen, environmental officer in the United Nations Trust Territory. But the deep bays with sheer underwater cliffs invite the world's biggest tankers, whose great drafts leave them with few harbors to call home.

Except for a new facility in Alaska, no ports of the world's largest consumer of energy, the United States, can accommodate the big vessels.

More than half the oil imported by the U. S. comes from the Middle East and Africa, across distances that make superships economically attractive.

Deep in the belly of a giant, Lilliputian workers assemble a 3.8-million-gallon cargo tank in the *Eso Pacific* during construction in Japan last year. A welder cranks on

To enter port, however, a VLCC of 250,000 tons requires a safe-water depth of about 75 feet, and some ULCC's require more than 100 feet. No East or Gulf Coast port offers more than 45 feet, and West Coast ports offer little more. Superships park 50 miles or more from land to be unloaded, or lightered, by smaller tankers.

At a refinery on the Mississippi near New Orleans I boarded the *Sepia*, a tanker of some 69,000 tons, bound for a rendezvous with a ULCC in the Gulf of Mexico. "When she was built in 1961, the *Sepia* was among the biggest tankers in the world," said marine superintendent Philippe Hubert.

After an eleven-hour trip down the river channel and four more hours on the open sea, she nestled up to the 310,000-ton *Limopsis* like a hopeful nursling. Lashed together, with six-ton rubber balloons between them as fenders, the two ships drifted while crude oil flowed through transfer pipes.

Government Leery of SPM's

Another answer to shallow-draft harbors is the **Single Point Mooring (SPM)**. SPM's allow deep-draft vessels to hook up to a buoy often 20 to 30 miles offshore and have their cargoes pumped ashore through submerged pipelines. More than 80 SPM ports exist around the world. The first one in U. S. waters is only now under construction off Louisiana, and probably won't unload its first ship until the early 1980's. "The deliberateness with which approval was given reflects national concern for environmental matters," I was told by Kenneth Biglane, chief oil-spill expert for the Environmental Protection Agency. Even after governmental approval, the project stalled when the oil industry objected to antitrust measures that it considered excessive.

This nation's first port for superships now operates at Valdez harbor—a glacier-carved finger extending from Prince William Sound, and end point of the Alaska pipeline. * Entry to the spacious harbor, bordered by mountain peaks that begin at the water's edge, is through a 900-yard-wide bottleneck called the Valdez Narrows. The narrows would hardly seem to justify the name were it not for Middle Rock, a pinna-



requent low visibility and winds that can gust to a hundred knots and you have a **superport that harbored a controversy long before it received its first big ship**, the *ARCO Fairbanks*, in April 1977 (page 105).

"The most catastrophic spill out of the pipeline would be 60,000 barrels," points out Charles A. Champion, Alaska's pipeline coordinator and an advocate of strict safety standards for the harbor. "A 165,000-ton tanker carries about one *million* barrels."

The threat has not been lost on the U. S. Coast Guard. One of the most modern vessel-traffic systems in the world has been set up in the town of Valdez, just across the harbor from the oil-loading berths.

Only one-way traffic is allowed through the bottleneck, explained Coast Guard Lt. Comdr. Ken Thompson. Ships in Prince William Sound must follow traffic lanes, like a divided highway on the sea. In the narrows, high-resolution radar constantly monitors the exact location of each ship.



One false move by a navigator at the National Maritime Research Center tanker simulator (above) can bring illusory disaster—and a lesson cheaply taught. The Long Island facility uses computer-

generated images to simulate real-life situations. Near Grenoble, France, captains maneuver mini-tankers around a training lake (below) complete with ports, buoys, and man-made waves.

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DAVID DOUBILET

Murky waters of economic and environmental uncertainty cloud the future of tankers such as this 226,000-tonner, whose 30-foot propeller dwarfs a frogman on cleaning chores. The resolution of such issues as oil spills, building more pipelines, and tapping alternative energy sources will determine whether these behemoths survive or go the way of the dinosaur.

"But the backbone of the system is communication," said Thompson. "We are in contact with every ship in the sound."

Radar, traffic lanes, perfect communication—none can guarantee an accident-free port. "You could be heading into the narrows and lose your steering mechanism," said Capt. Wayne McKee, with 27 years of seamanship. "But what are you going to do, stop running tankers because of accidents? Hell, no! People have decided that the damages are acceptable."

Oil Spills: More and Bigger

Acceptability wore thin in 1977 and 1978, dark years in peacetime tankering. "Last year shaped up as one of the worst years on record," said Arthur McKenzie, the tanker-data collector. "Fourteen total losses in the first six months. And the total tonnage of oil lost has been going up every year."

In numbers of wrecks, the safety record of big ships is superior. Of 1,513 tanker accidents from 1973 through 1976, only 77 involved tankers of 200,000 or more tons.

Safety would seem to be on the side of the superships. But disaster rides with their gargantuan cargoes. The *Argo Merchant*, a ship of 28,000 tons, stirred concern when it poured seven and a half million gallons of heavy fuel oil off Nantucket in late 1976. The supership *Cadiz* dumped 69 million gallons along a rugged coast that is important to France's fishing and tourist industries.

Scientists sponsored by the American Petroleum Institute, an oil-industry group, claim that marine life is only temporarily damaged by a massive spill. Even EPA's Kenneth Biglane said at a 1977 oil-spill conference in New Orleans, "I've never heard of a permanently crippled environment because of an oil spill." The EPA continues research into the matter, he added, because "we do know there are long-term and dangerous effects on the environment."

Scientists at the Woods Hole Oceanographic Institution on Cape Cod felt they were close to an answer after the *Argo Merchant* spill. "In the first days following the grounding of the tanker, we established a series of bottom stations in spots where the spilled oil would be likely to accumulate."

the area; oil had covered it and we found only a third as many marine animals. Studies by others of the spread of the spill over the Georges Bank indicated severe mortality to fish eggs at the surface of the sea.”

When is a supership safe? The tanker industry has spent millions on safety devices for ships turned out in the past few years; a collision-avoidance system alone costs \$125,000. Critics say more is needed: twin propellers for greater maneuverability; **double hulls** to provide an extra shell around the cargo; more crew training and certification. The industry agrees on the last point.

“Human error is responsible for the majority of tanker casualties,” said an executive. “Better training and stricter enforcement of regulations, not equipment changes, is the answer to most of our problems.”

Still, who can train to control human emotion? Fatigue, boredom, anger—all can affect critical navigation judgments at sea. Tension between captain and chief officer may have contributed to the disastrous 34-million-gallon spillage from the *Torrey Canyon* off Cornwall, England, in 1967.

Simulators, using computer images of busy oil terminals, can prepare supership captains for a variety of emergencies.

At the National Maritime Research Center at Kings Point, New York, skippers can sail in and out of Valdez Narrows in 100-knot winds, or experience steering failure while approaching Middle Rock.

Mini-Tankers Help Super Captains

About 125 miles from the sea, in the rolling hills near Grenoble, France, captains practice supership maneuvers in small-scale models (page 119). On an eight-acre lake called Port Revel are miniature piers, single-point moorings, and a wave-making machine. Like their huge counterparts, the 20-to-50-foot models are heavily weighted and underpowered. Trainees operate the mini-ships in two-man crews—a captain perched in the little superstructure, murmuring instructions to his colleague who operates the controls from a cockpit.

“This model weighs 18 tons and simulates a ship displacing 286,000 tons,” explained one of the French instructors at the school.

two-tenths horsepower and time lags are built in, so it reacts exactly like a big ship, only five times faster.”

With Captain Delesalle at the controls, I ordered: “Half astern.” The model, representing a fully loaded VLCC, backed away from the pier.

Nothing had prepared me for the drama and tension in supership command. Rudder response, I found, was agonizingly slow, and the sideslip on turns reminded me of a car spinning on ice. At last I headed uneasily for a berth.

“You are half a mile from berth and making six knots,” warned my engineer. Too fast. I stopped engines, but the ship barely slowed, so I called “half astern.” The tiny propeller futilely churned in reverse. “One hundred fifty yards,” was the impassive call of my instructor-engineer.

“Full astern!” I said, my voice rising, my hands gripping the sides of the tiny bridge. Too late. My mini-tanker swept onward, and its rubberized prow struck the pier with a meaningful *bonk!* Had I commanded a real tanker, the sound would have been of rending concrete and screaming steel.

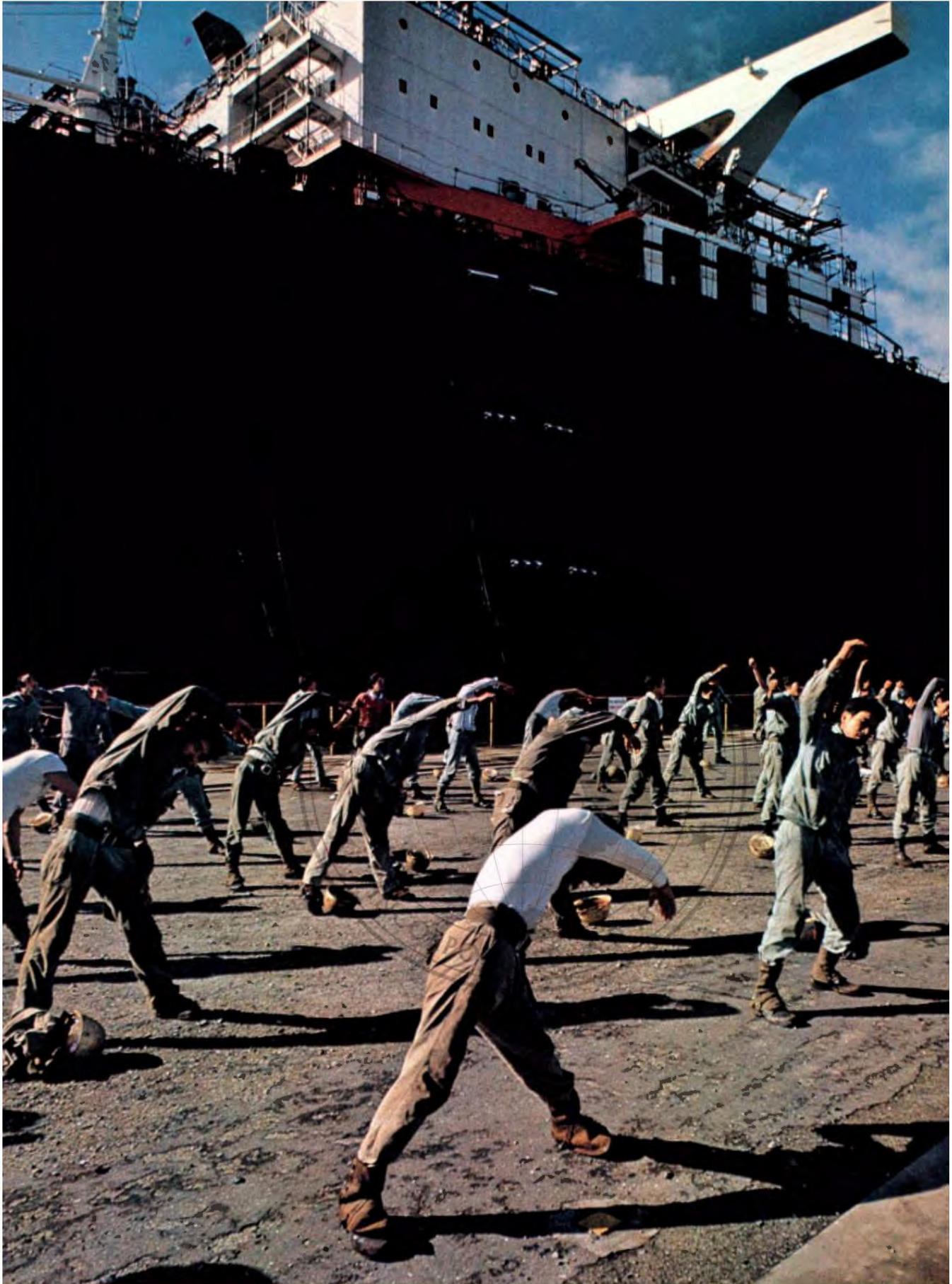
“You made the mistake that all new masters on big ships make,” said Captain Delesalle. “Too impatient. Remember, speed is your enemy.”

What Happens When the Oil Runs Out?

Patience, these days, is needed by supership owners as well as captains. Demand for oil slackened after the 1973 embargo and quadrupling of oil prices. Roughly a tenth of all the world’s tanker tonnage is now idle, lining the fjords of Norway, or sitting at out-of-the-way moorings off Borneo. Many of the ships have never hauled a cargo.

James Lee, president of Gulf Oil, believes the oil market will revive, but slowly. “If you’re going to have economic growth in the world, you’re going to have demand for oil. But it’s going to be well into the 1980’s before the available ships are fully used again.” Even after that, their future is in doubt.

“When the oil declines by the end of this century, what will the big ships haul?” said Bert Graper of Verolme Shipyards in Rotterdam. Outside his office window a





"You need long, steady runs to make big ships economical. What besides oil can offer that? Maybe liquid gas," he added. "But how would you unload steel, coal, or food 20 miles from shore?"

"It might be possible to slurry coal and pump it," suggested William O. Gray, senior adviser on tanker affairs for Exxon. "But with the finite supply of oil, it's doubtful a massive tanker-building program will be repeated. And the big ships we have now may be the last we will ever see."

If so, French Marine Shell's *Bellamy* may hold onto its claim as the biggest in the world, at 541,000 tons. Since 1955 the title has been claimed by more than ten vessels. One held the honor for a mere seven days.

When the *Bellamy* is fully loaded her keel hangs 94 feet below the surface of the water, her deck rises 24 feet above. Envision an 11-story building, 206 feet wide and more than a quarter of a mile long, surging through the sea with a cargo worth 50 million dollars.

Computer Mans Helm of Biggest Ship

Martin Rogers and I boarded *Bellamy* offshore at Anglesey, Wales, where she was lightering off oil on her third stop since leaving Kuwait a month earlier. Now she rode high enough to enter port at Rotterdam. She sailed after midnight on the three-day leg, an island of technology, an oilberg, steady as a rock in the restless North Atlantic.

Radio waves that were bounced from a satellite constantly updated her position. For two days I saw no one touch the wheel. "The ship is steered by autopilot, on a course programmed into it by the officer on watch," explained the chief officer, Philippe de Pastres. "An alarm sounds if there is any deviation from the intended course."

Capt. Arsene Foursin, the dapper master of the *Bellamy*, smiled confidently. "We have the safest ship in the world."

On one side of the bridge a display screen showed a computerized image of the hull, with shaded areas indicating which of the 40 tanks were loaded. "By simulating load distribution on the computer," explained the chief officer, "we can sight dangerous stresses before they occur."

that false information onto the typewriter-like keyboard. Lights blinked, an alarm sounded, and stress lines on the screen flashed through the side of the hull. The chief turned to me with a Gallic shrug. "We just broke in half."

Still in one gigantic piece, we approached the entrance to Rotterdam's Europort, where five tugs churned out to meet us. With two tugs at the stern, two at the bow, and one alongside, they coaxed the *Bellamy* to berth like impatient children.

World's largest port, Europort receives a quarter of the oil used by all western Europe. Tankers and cargo ships—more than 30,000 each year—share the narrow channels. A new traffic-monitoring system will offer a 24-hour video display of the entire port, with computer capability that, it is hoped, will predict possible collisions.

The system, said R. K. Bleekrode, coordinator of the port management project bureau, will protect the big tankers, which constitute 4 percent of the traffic. "The consequences of an accident with one of them would be enormous," he told me in his office overlooking the crowded and almost perennially hazy port.

"We used to live in a time of high risk and low consequences. Now we live in a time of low risk but high consequences."

Will Sampan's Fortune Mirror Our Own?

I remembered that night in the Strait of Malacca when the course of the *Afran Zodiak* was lined by the lanterns of sampans. I had peered ahead into the black until I spied a single, feeble light directly in our path.

Leaving the bridge, I walked the deck to the darkness and quiet of the bow. By then the light was quite near and, yes, just slightly to port. We drew even, and I could barely make out a tiny, shadowy figure, and a bamboo cabin aft.

I imagined standing there with him as the great mountain of a ship passed at the edge of his lantern glow until there was seemingly no beginning and no end to it, only the gray wall moving and the hiss of water against the hull. I'm sure the sight filled him with awe, and gratitude that the huge vessel that caused him temporary concern had passed

SUPERSPILL

Black Day for Brittany

Photographs by

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Text by NOEL GROVE

SENIOR EDITORIAL STAFF

TARRED BEACHES. Chocolate seas. Under smothering muck, waves break near the shore with muted sounds. Fish float belly up, and oiled birds spot the beaches.

The maritime nightmare feared by tanker friend and foe alike came alive on March 16, 1978, when the *Amoco Cadiz*, 229,000 deadweight tons, lost her steering off the Brittany coast.

Twelve hours later, after heavy swells thrice snapped the towing cables from a large tug, the ship drifted onto rocky shoals. Some 69 million gallons of Arabian oil flowed into the sea, more than double the amount spilled in the *Torrey Canyon* disaster 11 years earlier, almost to the day.

Dark tentacles, turning russet in seawater, spread over Brittany shores, triggering a massive man-powered cleanup (right). Some biologists predicted that the damaged areas would quickly regenerate. Local residents, their fishing economy stymied, posted hand-painted signs that read. "*La mer*

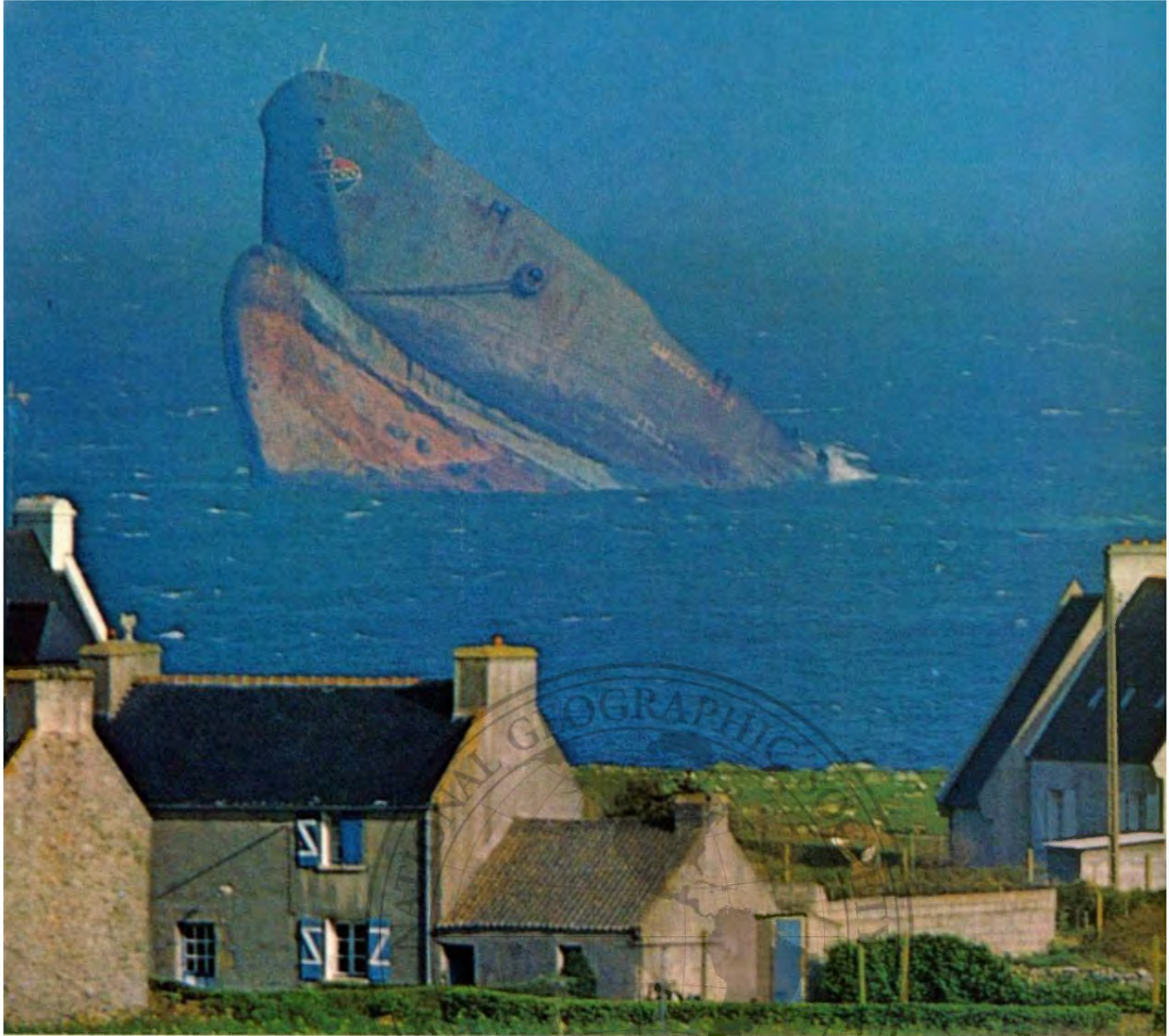




AS AWESOME IN DEATH AS SHE WAS IN LIFE, the grounded *Cadiz* spews oil from ruptured tanks as waves break over the bridge. The Liberia-registered ship had passed inspection by the American Bureau of Shipping ten months earlier. A

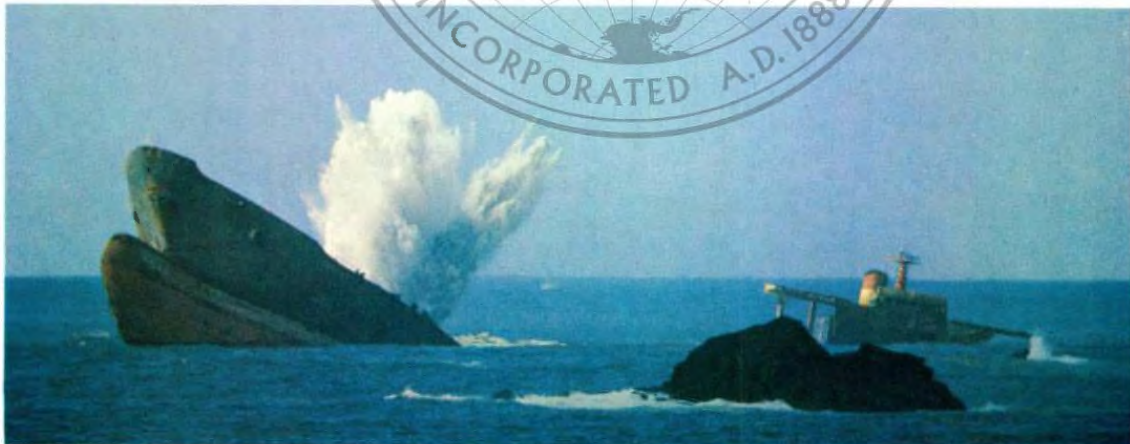


board with Capt. Pasquale Bardari that first night, after the Italian crew had been airlifted to safety. "Then she broke her back, with a screech of metal and a shower of sparks that lasted about ten minutes. As water rose and fell in the stairwell, it created



History's largest oil spill tainted more than a hundred miles of a coastline known for its vigorous fishing industry and a rustic charm that attracts tourists from all over Europe. Marine life had recently





SIPA-PRESS/BLACK STAR

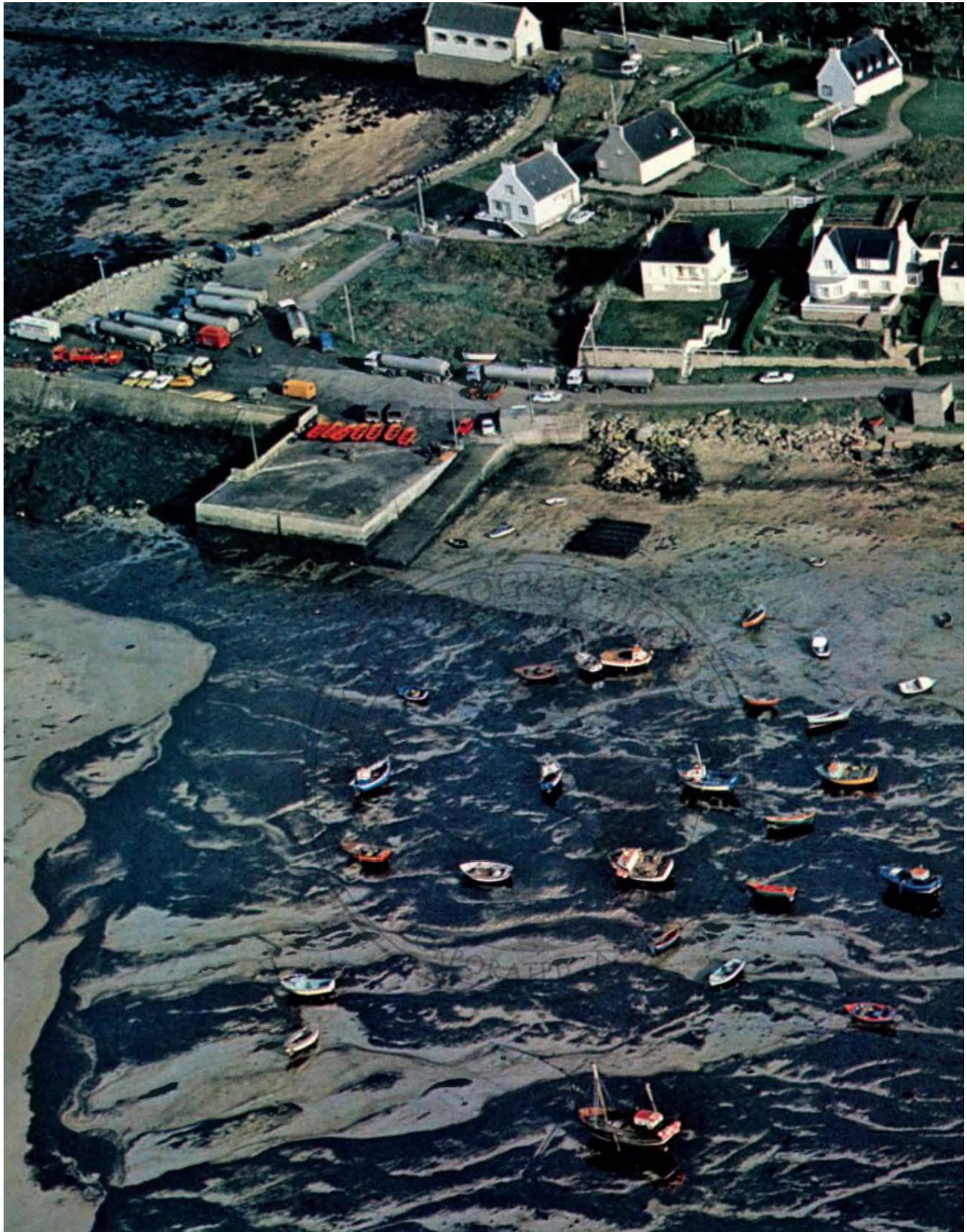
LIKE A HUGE TOWN-EATING SHARK, the bow of the *Cadiz* rears from the sea some two miles off Portsall (top), a distance foreshortened by the camera's telephoto lens. A threat more real. gradual leakage from the 13 cargo tanks delated



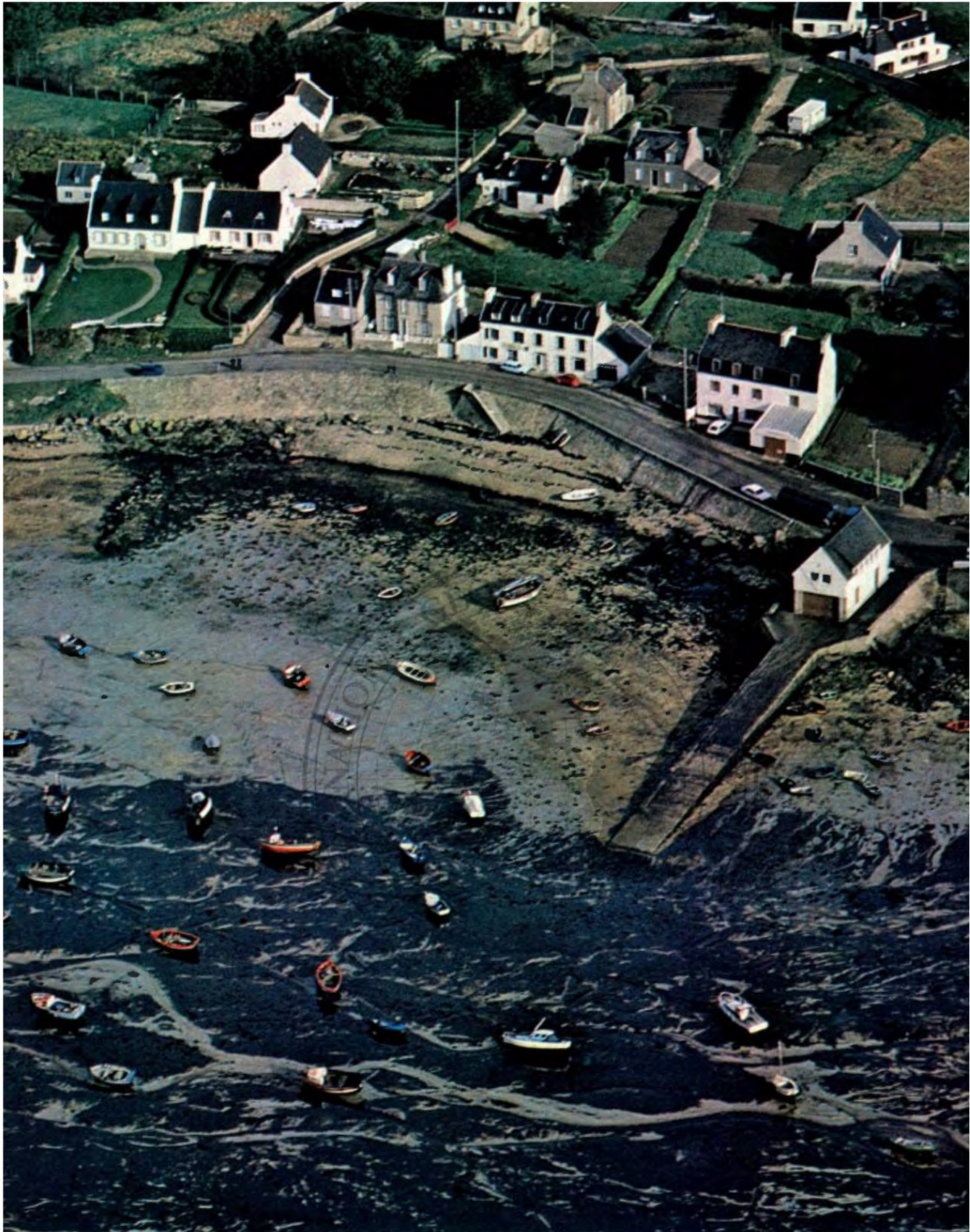
SIPA-PRESS/BLACK STAR (ABOVE AND RIGHT)

AT THE FRONT LINES of the battle against pollution, soldiers and volunteers string an inflatable boom in shallows to protect the beaches of Roscoff. High wind

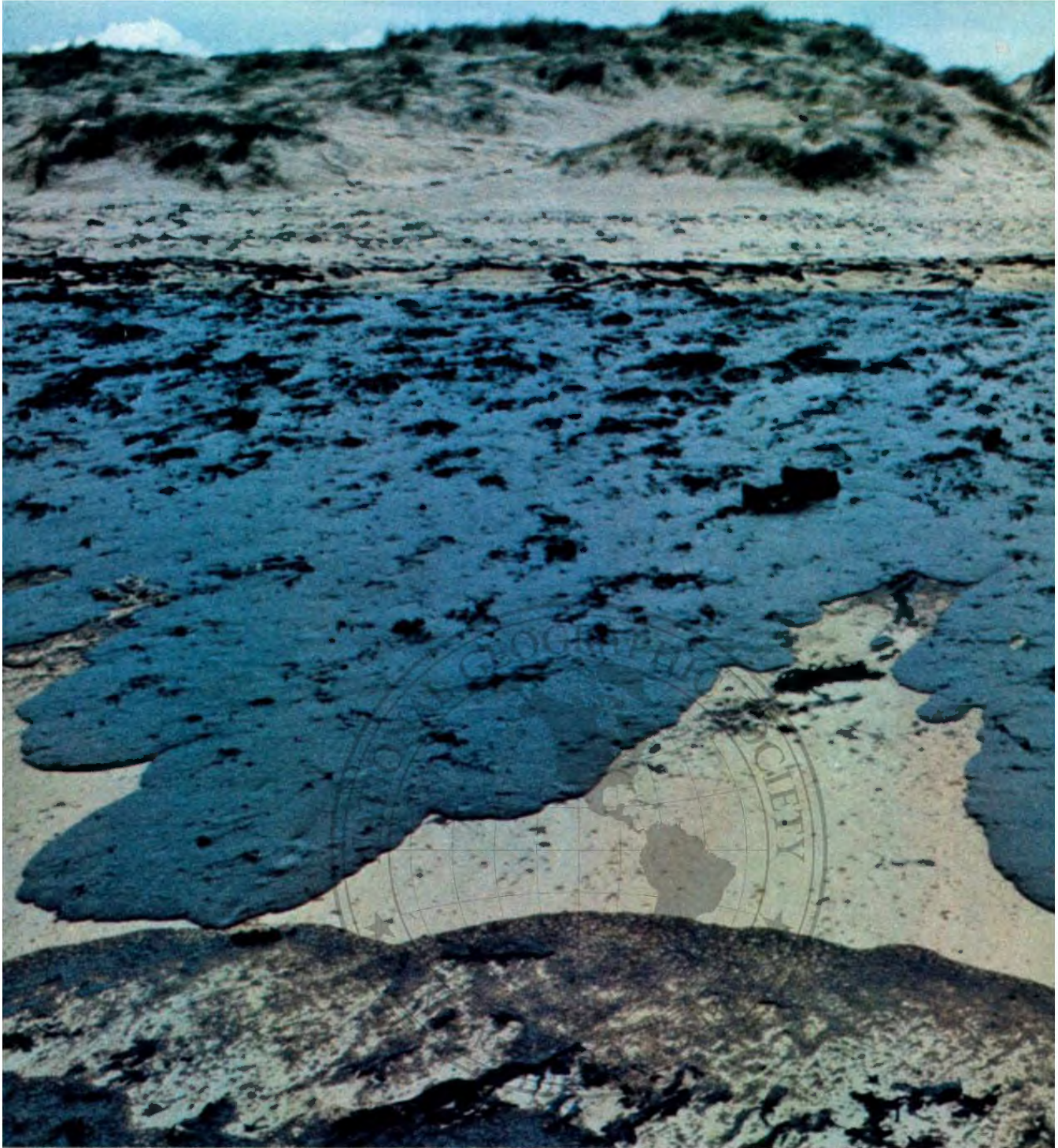




FEBB TIDE PAINTS A BLACK MOSAIC on the Portsall harbor, where oil-fouled engines have crippled local fishing boats. "It took me seven years to pay for my boat," said fisherman Jean-François Moullat. "Now it sits idle." Oil doused some



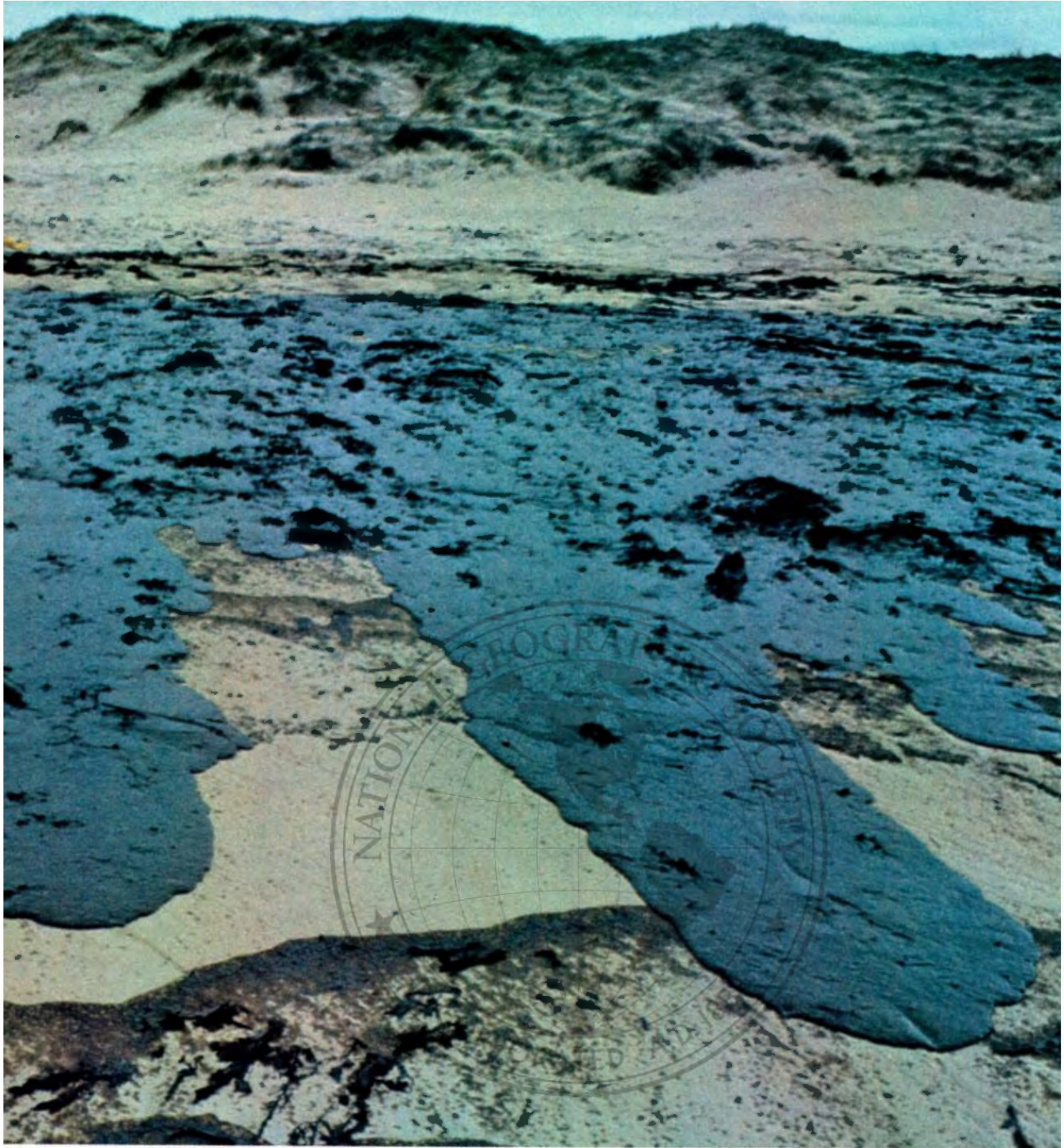
threatened. Adult finfish were poisoned when the highly toxic crude permeated the water below the surface. On the beaches, cleanup crews armed with shovels, pails,



LICKING SEAWARD, tongues of oil stranded by the receding tide creep down the white sands of a Brittany beach. Stung by their fourth oil spill in 11 years, Bretons called for rerouting tankers farther from their coast. Internationally, the accident renewed demands for stricter inspection procedures and navigational regulations.

“Seven to ten years may pass before the

Torrey Canyon spill. “Even then, some rare species may be gone,” he added. “Sea-bird populations appear to suffer the most.” Thousands of birds died soon after the *Cadiz* spill, although volunteers cleaned and force-fed oiled victims at *hôpitaux des oiseaux*—bird hospitals. “They are not hospitals, they are morgues,” said Kenneth Biglane, American oil-spill expert on the scene. A lichen-covered rock



SIPA-PRESS/BLACK STAR (ABOVE AND BELOW)

