# Chapter 4
# Federal Services and Regulation

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## OVERVIEW

The oil and gas development process largely is controlled by private industry after leasing lands from the Federal Government. However, industry must adhere to the terms of the leases which include safety and environmental regulations and stipulations. There is, therefore, a significant Federal responsibility to develop effective environmental standards, establish safe practices, monitor development activities, inspect operations, enforce regulations, and provide backup for emergency situations. These are broadly defined as regulatory responsibilities.

In addition, the Federal Government performs a number of public services which can affect the pace, the cost, and the reliability of future offshore development. Some of these services are provided for multiple public uses and offshore development is just one of these. Satellite data collection and provision of navigation systems are examples. Other services may be provided to fulfill broad national needs. Basic and applied research that will add to general knowledge of ice mechanics, oceanography, and materials applications in the Arctic are examples.

The Federal Government is both a regulator (e.g., of personnel safety) and a facilitator (e.g., in providing environmental information) of offshore development. Key questions about these two Federal responsibilities are:

- Are present technology and institutional arrangements adequate for meeting Federal responsibilities?
- Is the level of Federal involvement in the development of Arctic and deepwater frontiers adequate?
- Does the present level of Federal activity in these areas adequately safeguard the public interest?
- Is the division between Federal and private efforts appropriate?

## RESEARCH AND DEVELOPMENT

The level of difficulty and the technical complexity of offshore petroleum systems in Arctic or deepwater regions dictates the need for substantial research and development efforts by industry and government. Industry sponsors research directed at developing or improving cost-effective and environmentally safe oil production systems. The Federal Government sponsors research which may enable it to perform its regulatory or service functions and research which advances the state of the art and knowledge in materials, environmental conditions, and technology.

### *Federal Research Programs*

Although no major Federal program is focused on long-range development of Outer Continental Shelf (OCS) deepwater or Arctic frontier technologies, some work of this type is sponsored by the Sea Grant Program. The lack of this type of research may be partly a result of the executive branch and petroleum industry views that such efforts are properly left to private companies rather than the government. However, several Federal agencies have direct or indirect missions which require research activities related to the development of offshore petroleum resources. These are the Department of the Interior (DOI), the National Oceanic and Atmospheric Administration (NOAA), the U.S. Coast Guard and the Maritime Administration (MarAd) of the Department of Transportation, and the Department of Energy (DOE). In addition, the Office of Naval Research (ONR), the National Science Foundation (NSF), and the U.S. Army support Arctic research efforts which have spin-offs or goals which are related to offshore petroleum work.

As the regulating agency for the development of offshore oil and gas, the Minerals Management Service (MMS) in DOI supports several technology research and environmental assessment programs. The most important offshore technology research effort is the the Technology Assessment and Research Program (TA&R). The TA&R Program is designed to meet the need for an independent Federal assessment of the status of offshore technology so that MMS operations personnel can carry out their ' 'regulatory' or "inspection' activities. The program focuses on technologies pertaining to blowout prevention, verification of the integrity of structures and pipelines, and oil spill containment and cleanup.

The TA&R program supports the following MMS functions: safety and pollution inspection, enforcement actions, accident investigations, permit and plan approvals, and well control training requirements. Where technology gaps are identified, original research is performed. Studies are conducted by universities, private companies, and government laboratories. Each work task provides for technical dialog between investigators, the industry, and MMS operations personnel. These investigators are used as staff adjuncts who present their work to MMS operations personnel through a technology transfer network of working groups known as Operations Technology Assessment Committees located in regional OCS offices and in headquarters.

Projects are conducted wherever possible in advance of OCS leasing. The TA&R Program, together with the technology transfer network, also is used by MMS as the primary method for identifying the "best available and safest technologies, " which industry is required by law to use. About one-third of the projects are assessments and two-thirds examine technology gaps. Although the program covers all Federal leasing areas, a major emphasis is on the Arctic and deepwater. About one-third of TA&R projects are participatory with the industry (see table 4-l).

The Outer Continental Shelf Environmental Assessment Program office of NOAA undertakes or manages much of the environmental data collection program under the MMS Environmental Studies Program. Additionally, the National Weather Service, a part of NOAA, collects and disseminates weather data, and NOAA participates with the U.S. Navy in the operation of the Joint Ice Center. NOAA also has recently announced a research project to study Arctic storms.

The DOE Arctic program has acted as a clearinghouse for government and industry technology research. In addition, technology programs have included sea ice engineering properties; geotechnology related to sediments and their interactions with ice and seismicity; and concept studies of the development of petroleum resources found below

**Table 4-1 .—Representative MMS-Sponsored Arctic and Deepwater Research Projects**

| |
|---|
| Engineering properties of multiyear sea ice[a] |
| Ice forces against Arctic offshore platforms |
| Reliability of concrete structures in the Arctic[a] |
| Assessment of ice accretion on offshore structures |
| Fracture toughness of steel weldments for Arctic structures |
| Dynamic response of offshore structures due to waves and vortex shedding |
| Unmanned free-swimming undersea inspection technology |
| Fluidic mud pulser for measurements while drilling systems |
| Acoustic transmission of digital data from underwater sensors |
| Control of blowout fires with water sprays |
| Subsea collection of oil from a blowing well |
| Demonstration of the capability of a robot inspection vehicle for the performance of useful work |
| Applications of risk analysis in offshore safety |
| Early detection of damage in offshore structures by a global ultrasonic inspection technique |
| Development of improved blowout prevention procedures for deepwater drilling operations |
| Environmental cracking of high strength tension members in seawater[a] |

[a]Joint project with industry.
[b]Joint project with another agency.

SOURCE: Minerals Management Service.

the ice canopy in deep Arctic waters. In the past, DOE sponsored a research program directed at long-range technology development, including a sizable drilling technology program. Some DOE drilling research is now carried out under the DOE geothermal program, and there may be spin-offs to petroleum drilling.

MarAd sponsors research related to the future of the U.S. shipping industry. In order to understand the problems of commercial ships in navigating the Arctic Ocean, MarAd has supported studies in ice navigation. Using Coast Guard icebreakers, trafficability studies have measured power requirements, the time required to navigate through ice-infested waters, and the forces imposed on ships by the ice. Funding for this work has been significantly reduced in recent years.

ONR traditionally has supported research in those disciplines which would provide the basis for the understanding of natural phenomena and which might be used in the development of new equipment or at-sea naval operations. Research information developed by ONR academic investigators is generally published in the scientific literature and thus available to the agencies and industries involved in Arctic energy resource development.

NSF supports a broad range of basic research addressing Arctic scientific problems. The NSF research grants that pertain to offshore areas include biological, oceanographic, geological/geophysical, glaciology, meteorology and atmospheric sciences, and engineering.

The U.S. Army Cold Regions Research and Engineering Laboratory is a specialty laboratory operated by the U.S. Army Corps of Engineers. The laboratory focuses on geophysics and engineering in the world cold regions as these subjects relate to military operations and construction. The laboratory also possesses a large library that works in conjunction with the Library of Congress to access the world literature on the geophysics and engineering of the cold regions. The Army laboratory has a long and distinguished record of work on problems related to the science and engineering of the polar oceans. This has focused on problems caused by the presence of ice, ice islands and icebergs, snow cover, and subsea permafrost. Most research on polar ocean problems has been funded by other government agencies and private industry.

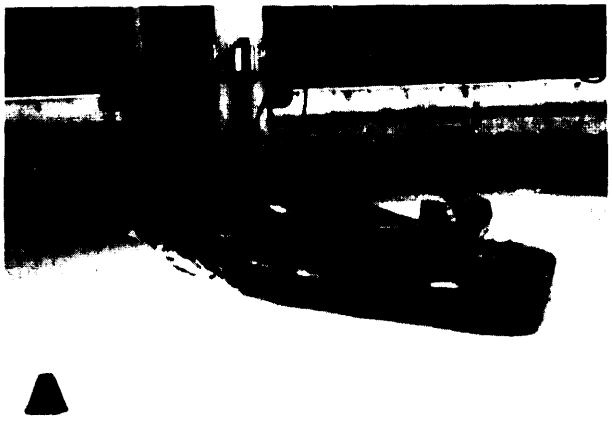


Photo credit: ARCTEC, Inc.

Model ice-breaking tanker (a scale replica of the SS Manhatten) being tested to measure force required for passage through first-year ice

## *Future Research and Development*

It appears that industry's research and development needs will continue to be met in a timely manner without any significant changes in Federal policy or incentives. However, there are concerns related to the government role in supporting and monitoring future research, maintaining national facilities, and supporting excellence in universities and other research institutions. Some have been concerned about the uncoordinated and fragmented nature of Federal programs, and suggestions have been made to consolidate or coordinate research through a joint industry/government/academic council.

Most industry spokesmen support the existing MMS research program which concentrates on matters directly related to that agency's regulatory role. However, they believe any expansion of this program may overlap with industry activities. Academic researchers generally maintain that the present government effort is not sufficient to assure adequate support for basic and advanced engineering research and to provide continuing support for education. Larger and longer term commitments may be needed to accomplish relevant basic research, to prepare academic institutions to better accommodate and address specific industry needs, and to ensure a steady supply of well-trained and talented scientists and engineers.

While cooperative industry research has produced hundreds of reports on critical subjects, very few of these have been made available to the public. Most research and data are kept confidential by the participants, but it could possibly be made public after a certain time period. There is generally a need to promote more cooperation between the Federal Government, industry, other public groups, and other governments in Arctic programs. Efficient data collection often requires coverage over territories of several nations (e.g., Canadian and Alaskan Beaufort Sea regions). Cooperative research with public groups could assist communication of the results and the implications of development options.

One of the greatest values of federally sponsored research is the ability of some agencies to design programs with multi-year continuity so that basic problems can be consistently studied and long-term data can be collected and applied. This is essential to an undemanding of some basic phenomena such as ice movement and forces, meteorological, and oceanographic processes. It is, therefore, important to maintain continuity in many of the government-supported research efforts.

One approach to enhancing Federal research efforts is contained in the Arctic Research and Policy Act (ARPA) of 1984. The Act finds that Federal Arctic research is fragmented and uncoordinated and that a comprehensive policy and program to organize and fund Arctic scientific research is necessary to fulfill national objectives. National Arctic objectives specifically cited in the bill, which require or would benefit from a more comprehensive scientific research effort, include development of the living and nonliving resources of the Arctic, environmental protection, national security, mitigation of the adverse consequences of development to Arctic residents, and better understanding of global weather patterns.

ARPA creates two new institutions—the Arctic Research Commission and the Interagency Arctic Research Policy Committee—to carry out the purposes of the Act. The Interagency Arctic Research Policy Committee is composed of representatives of all Federal agencies with responsibilities in the Arctic. The National Science Foundation chairs the Committee and is responsible for ensuring the implementation of national Arctic research policy. ARPA calls for a 5-year implementation plan, which, at a minimum, must assess national needs and problems regarding the Arctic and the research necessary to address those needs and problems. The Arctic Research Commission is, in essence, an independent advisory board. The Commission is responsible for: developing and recommending an integrated national research policy; facilitating cooperation among Federal, State, and local governments; and assisting in developing the 5-year plan.

However, ARPA provides no additional funding for Arctic research. Moreover, although the law urges agency coordination and integration of research programs, there is no authority in the bill to direct departmental budgeting. Therefore, departments will continue to set their own research priorities based on agency-specific missions. Without research funds and with authority limited to giving advice and making recommendations, the Commission's present duties are limited. However, both the 5-year implementation plan and the survey of Arctic research that the Interagency Committee will conduct will be useful if they help coordinate the overall Federal Arctic research effort.

# FEDERAL SERVICES

## *Environmental Information*

Firms engaged in offshore oil and gas development require a great deal of technical environmental information—information about weather, ice, oceanographic conditions, soil mechanics, and seismicity—for the design and operation of offshore structures and supporting systems.

The offshore industry receives information on these conditions from both Federal and private sources, and many firms collect their own data as well. Federal environmental data services are designed to serve the public at large, broad sectors of the economy, and the needs of other Federal agencies. Such information is used by the offshore petroleum industry to gain information on global, regional, and local conditions over both short and long timeframes. There is no charge for most Federal forecast or operational data products. However, charges are assessed for some products that have more identifiable users (e. g., for provision of LANDSAT images), and often users must pay for the communications devices (e. g., dedicated phone lines) used to access information.

The main Federal agencies involved in collecting, processing, and disseminating offshore environmental information are NOAA, Navy, the National Aeronautics and Space Administration (NASA), and the Air Force. NOAA is the primary point of contact between civilian users and Federal agencies. Principal NOAA units are the National Weather Service; National Environmental Satellite, Data, and Information Service; and the National Ocean Service. The Navy/NOAA Joint Ice Center plays a key role in disseminating ice charts and other ice-related information. NOAA has several units involved in maintaining and improving user services, notably two Ocean Service Centers in Anchorage, Alaska and Seattle, Washington.

Most data used by Federal agencies come from federally operated satellites, ships, and other systems. However, agencies also incorporate data from private sources. Site-specific information used by firms developing oil and gas resources is usually obtained from private firms, including the firms contracted to conduct actual operations. For example, operators in an area affected by ice movements may supplement information received from Federal agencies with direct observations from company supply vessels or helicopters.

"Value-added private firms take> historical and/or forecast data from Federal sources, refine it by additional processing and interpretation, and often supplement it byadditional observations. Such firms tailor products to specific user needs, giving forecasts with greater frequwncy and more geographic specificity than usually can be obtained from Federal agencies.

## Information Needs

There are some problems with the current provision of offshore environmental information. Voids exist in historical and near real-time data. There is less information available about some types of environmental conditions and some offshore regions. Greater precision and accuracy are needed in describing and forecasting conditions. For some activities, the environmental information available may be insufficiently precise. Many users desire greater accuracy and better spatial resolution in the observations and forecasts. In addition, products may be too infrequent. Some users suggest that the time intervals between measurements of conditions, and between measurements and delivery of information to users, should be shortened. The need for more accurate, longer range forecasts has also been stressed.[1]

Data are lacking for a variety of reasons. For example, the sensors mounted on current NOAA satellites are impeded by clouds, fogs, blowing snow, and in the case of sensors restricted to the visible spectrum, darkness. Outside of well- traveled ocean routes and populated coastal areas, data to supplement satellite observations are limited. Minimal archived data are available for use in "hindcasting" conditions. Much of the satellite data which could be available are not collected and that collected are usually not archived because of either a lack of funds or the absence of a specific program to do so.

Nontechnical problems also affect the performance of Federal agencies. Many NOAA programs have been targeted for reduction and may find it difficult to cope with the increases in user demands likely to occur with the expansion of Arctic development. Suggestions have also been made that the Federal Government establish a single focal point for collecting, evaluating, and disseminating environmental data.

An OTA survey showed that improvements may be needed in many information areas for pre-lease sale planning and, to an even greater extent, for site development. Types of information most fre-

[1] National Advisory Committee on Oceans and Atmosphere, "Ocean Services for the Nation," January 1981.

quently mentioned as needing improvements are: ice-related information in the Chukchi and Beaufort Seas, and to a lesser extent, the northern Bering and Norton Sound; soil geotechnical properties in every offshore area; permafrost in the Chukchi and Beaufort; storm surges in the Chukchi and northern Bering; wave climatology in the Chukchi and, to a lesser extent, the Bering; currents in the Chukchi; and wind velocity and visibility in the northern Bering, and bathymetry, to a lesser extent, in all areas. Information about air temperature, precipitation, and tides was generally seen as being satisfactory or not requiring major improvement.

Better data about environmental conditions could result in financial savings and improve the safety of offshore operations. Lack of information about environmental conditions may cause overdesign of drilling platforms and ships. Better information could reduce a portion of the costs associated with overly conservative design.

Several rigs have been lost to severe storms in non-Arctic areas, at a cost of scores of lives and tens of millions of dollars, and oil spills have resulted from ship accidents. While human error has often been a contributing factor, better information about storms could help prevent recurrences of these events.

Operations are planned and carried out on the expectation of suitable weather, ice, and ocean conditions. Adverse environmental conditions often cause offshore operations to be suspended. When expensive pieces of equipment and their supporting systems are laid up due to unforeseen changes in environmental conditions, additional expenses quickly accumulate. For example, lease costs for semi-submersibles can exceed $50,000 per day, with weather-related losses of over $1 million per rig per year not uncommon. Similarly, many days are lost for resupply operations due to weather conditions. It is possible that better information could reduce such losses.[2]

More efficient ship routing, based on better information, could also result in large savings in time at sea, and associated costs in fuel, damage to cargo, and other items.

[2]Jet Propulsion Laboratory, ''Ocean Services User Needs Assessment'' (Apr. 5, 1984), pp. 4-29.

Photo credit: Gulf Oil Corp.

A great deal must be known about ice forces to allow safe Arctic operations

### Future Information Services

Federal agencies are undertaking several initiatives that may improve environmental information services. For example, the NOAA Ocean Service Center concept appears particularly promising as a way to improve contacts with users of NOAA services. Several technological improvements also are important, including new sensors scheduled to be placed on future satellites. These advances, especially new satellite systems, could substantially reduce data gaps. New Navy oceanographic and Air Force meteorologic satellites will penetrate cloud cover and other low visibility conditions with microwave sensors.

For extremely high resolution, synthetic aperature radar (SAR) imagery is needed. No U.S. satellite is scheduled to carry a SAR during this decade. However, planned European Space Agency (ESA), Canadian, and Japanese satellites are scheduled to have SARs. NASA has proposed to establish a SAR receiving station in Alaska to collect data on offshore Alaskan areas from the ESA satellite ERS-1, and NOAA has expressed interest in disseminating and perhaps processing such data. Acquisition of SAR data would greatly improve existing information on sea ice, and the offshore industry has gone on record in support of the proposed NASA receiving station and associated data processing capability. However, some uncertainties remain about acquiring the ERS-1 SAR data. Funding for the NASA and NOAA initiatives to handle such data have not yet been approved. It is also uncertain whether ERS-1 will be launched on time, and whether its sensors will be switched on while it is flying over Alaska.

It is equally uncertain whether operational products and real-time data would be provided as a result of accessing the ERS-1 SAR data. The offshore industry wants processed images made available to forecasters or industrial users within hours of data acquisition. Current NASA plans are to process data several days after acquisition. Near real-time dissemination of data would require additional processing capacity, and NASA does not see its function as including provision of operational products or real-time data. However, companies surveyed by the Jet Propulsion Laboratory at the California Institute of Technology expressed a willingness to contribute to a NOAA-sponsored pilot program to develop real-time SAR data dissemination, depending on the results of further study.

Another uncertainty lies in Administration plans for funding reductions for meteorological satellites from two polar orbiters to one. According to NOAA, a one-polar-satellite system would meet the core of U.S. weather forecasting requirements. However, the frequency with which any one area would be covered would be reduced from once every 6 hours to once every 12 hours. Reduction of frequency would have significant effects on prediction of weather affecting Alaska, Hawaii, and other Pacific territories, and on activities using satellite data services, This would be especially true in areas poorly covered by nonsatellite information gathering systems, including most of the offshore frontier areas. In addition, the amount of information shared with other countries would be reduced, potentially affecting reciprocal information exchanges.

In addition, the Administration is seeking to increase the role of the private sector in supplying environmental information services. In March 1983, the Administration endorsed the transfer of nondefense remote sensing satellite systems—LANDSAT, civilian weather satellites, and any future ocean sensing satellites—to the private sector. Weather services and, to a lesser extent, future ocean sensing services are considered by many people to be public goods, appropriate for the Federal Government to provide, even if at a loss. Congressional concern culminated in an authorization bill signed into law prohibiting the sale of the weather satellite system to the private sector. Plans for the sale of LANDSAT have continued, however, and legislation to transfer LANDSAT to the private sector was enacted in July 1984 (Public Law 98-365). Industries involved in offshore oil and gas development fear that nongovernmental managers of LANDSAT may not devote adequate resources to further develop remote sensing technology and that costs may greatly increase.[3]

Current NOAA plans are to transfer a portion of its nautical chart-making to the private sector. As with satellite commercialization, the Administration sees advantages in reducing the Federal role in an area where the private sector could take over operations. Critics have argued that safety could be reduced if fewer charts were made or if people were reluctant to purchase updated charts because of increased charges. There is also concern about Federal liability in marine casualty cases.

[3]U.S. Congress, Office of Technology Assessment " Remote Sensing and the Private Sector: Issues for Discussion-A Technical Memorandum " (Washington, DC: U S. Government Printing Office, March 1984).

## *Navigation Services*

Federal agencies operate ground stations and satellite platforms that beam radio transmissions used to navigate and to position vessels and structures. Such transmissions are vital to many offshore operations, such as vessel positioning for seismic surveys, positioning of platforms, pipeline laying, and tanker transport. Radio aids provide a high level of accuracy, combined with broad coverage. They are especially important in situations where visibility is reduced. Arctic operations in particular are, or will be, dependent on radio aids. This is because Arctic waters are relatively poorly charted and contain many hazards, short-range aids such as buoys are often difficult to maintain in Arctic waters, and visibility is reduced in many areas by extended darkness and frequent storms or fog.[4]

This section covers only those navigation services which are known as "radiodetermination." This encompasses both radionavigation and radiolocation, or positioning for purposes other than navigation. Federal agencies usually use the term "radionavigation when describing Federal services in this area. While Federal radio systems are used by the civil sector for uses going beyond navigation, the statutory responsibility of Federal agencies only extends to providing a level of service that is sufficient for safe and efficient navigation. Radiolocation or positioning generally requires more precise data.

### Federal Radionavigation Systems

Offshore operators commonly use their own shore-based portable positioning systems or contract with private companies for such systems during seismic exploration and for rig positioning, where high accuracy is needed. For many purposes, however, systems operated by the U.S. Coast Guard, Navy, and Air Force are vital to offshore exploration, production, and transportation of oil and gas.

The Coast Guard operates two types of long-range radio aids, LORAN-C and OMEGA. LORAN-C operates by measuring differences in the time of receipt between radio pulses from transmitters several hundred miles from each other. The usable range of LORAN-C is up to 1,500 miles, depending on system configuration. Worldwide, there are 43 U.S.-operated LORAN-C stations. While Alaskan waters up into the Bering Sea are covered by LORAN-C, waters north of Point Clarence either are not covered or coverage is subject to interference (see figure 4-l). At the present time, there are no plans to extend LORAN-C coverage to Arctic regions not currently served.

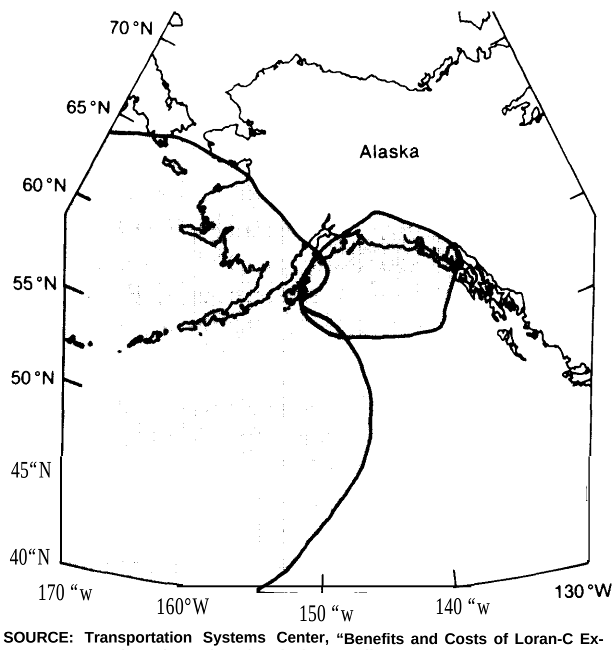
OMEGA is a radionavigation system similar to LORAN-C, operating at lower frequencies. It has greater range, covering the entire world, but its accuracy is less: 2 to 4 nautical miles for predictable and repeatable accuracy. Eight stations, two of which are in the United States, comprise the OMEGA system.[5]

The Navy operates a satellite system called TRANSIT, with the Coast Guard as the point of contact for civilian users. More than 90 percent of users of TRANSIT are civilians. The TRANSIT

[4]Maritime Transportation Research Board, "Maritime Services to Support Polar Resource Development" (Washington, DC: National Academy Press, 1981).

[5]Nevin A. Pealer, "Federal Radionavigation Planning," *Proceedings of the National Technical Meeting of the Institute of Navigation* (January 1984).

**Figure 4.1.— Loran-C Coverage of Alaska**




SOURCE: Transportation Systems Center, "Benefits and Costs of Loran-C Expansion Alternatives in Alaska," April 1983.

system has five satellites in polar orbit, with worldwide coverage. The limited number of satellites in the TRANSIT system means that, depending on their location, users experience gaps lasting from 30 minutes to several hours in the reception of transmissions. Transmission gaps are greatest at the equator, less at northern latitudes.

Present Federal plans are for LORAN-C, OMEGA, and TRANSIT to be phased out and eventually replaced by the Global Positioning System (GPS), which is to be operated by the Air Force. As with TRANSIT, the Coast Guard is to be the contact agency for civilian uses of GPS. When fully developed, the GPS will use 18 satellites, with three operating spares also in orbit. GPS is intended to provide highly accurate, continuous, worldwide positioning information for weapons delivery systems; however, it also will be used by civilians for nonmilitary purposes.

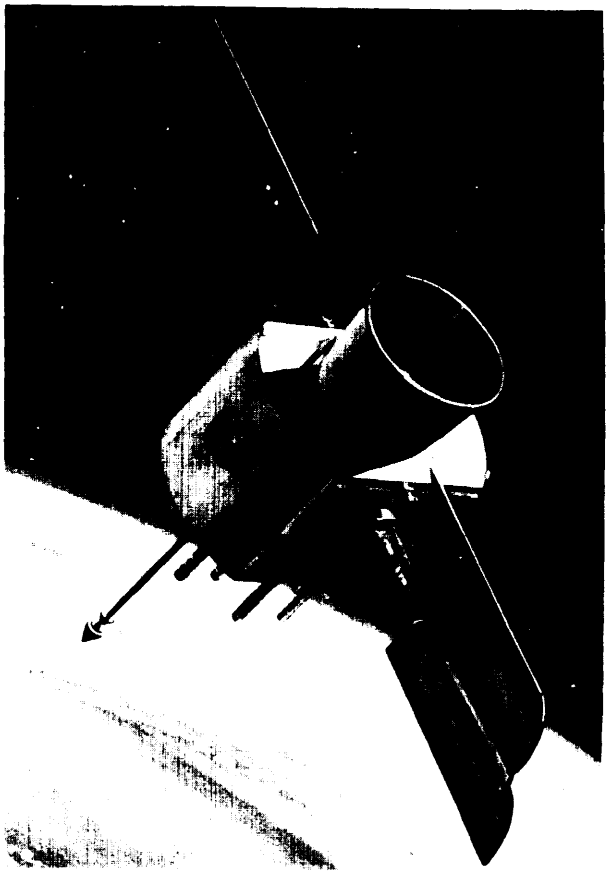


*Photo credit: Rockwell International*

The Global Positioning System (GPS) will provide radionavigation services for Arctic operators

GPS is currently in a research/demonstration phase. Some test satellites have been launched and used to verify the GPS concept. Launches of the satellites that will establish the operational system are scheduled to begin in late 1986, By 1987 or 1988, two-dimensional coverage suitable for marine operations should be achieved, with full three-dimensional coverage suitable for aircraft available by late 1988 or early 1989. TRANSIT is to be terminated in 1994, or as soon as the military can change over to GPS, which is expected to be complete by the early 1990s. Although termination dates for LORAN-C and OMEGA have not been fixed, suggested dates range from soon after 1994 to beyond 2000. The Coast Guard favors continuation of LORAN-C at least until 2000. Foreign LORAN-C stations could continue to operate for some time after domestic U.S. stations are terminated, depending on foreign governmental support.

The European Space Agency (ESA) is conducting studies on the feasibility of a 24-satellite civilian navigation system called NAVSAT. Funding may come from indirect charges, rather than through direct user charges. NAVSAT may have advantages over GPS in that it would be a civilian-oriented system, whereas GPS is primarily a military system. The timeframe for development of NAVSAT is not clear. In addition, the Soviet Union is developing a satellite navigation system called GLONASS that will be similar to GPS. It is not clear when GLONASS will become fully operational. Although initially intended for use by Soviet civil aviation and special-purpose ocean vessels, GLONASS may eventually be offered for worldwide use free of charge.

### Radionavigation Needs

Different radiodetermination tasks require different levels of accuracy. For example, seismic surveys require extremely high repeatable accuracy levels. Vessel navigation generally requires less accurate satellite data. OMEGA is adequate for ocean navigation, especially away from the coastal zone, but for other purposes does not provide sufficient accuracy. LORAN-C gives greater accuracy, and the continuous broadcasts of LORAN-C are an important asset. LORAN-C capabilities are sufficient for most coastal navigation. A major drawback of LORAN-C is its lack of coverage of northern Alaskan waters. LORAN-C and other nonsatellite systems are also more susceptible to atmospheric interference. TRANSIT provides greater accuracy than LORAN-C, but its usefulness is lowered by gaps in transmissions.

Whether or not current radiodetermination systems should be upgraded depends largely on evaluation of the prospects for GPS. Concerns have emerged regarding GPS agency/user relations, the accuracy of GPS information provided to civilian users, the timing of the phase-in of the system, and costs and charges to users.

If TRANSIT were phased out before GPS were made available, the overall level of Federal service would be lowered. Many users seek assurances that GPS will provide services comparable to existing systems, and that other systems will continue to operate until GPS provides such levels of service. The offshore industry believes that GPS user charges are acceptable in principle, but that such charges should be ' 'equitably' assessed. Industry groups have opposed plans that would favor recreational boaters or fishermen.

## *Icebreaking*

Alaskan Arctic waters are ice-covered or experience significant ice concentrations for all or part of the year. Specialized vessels that can operate in ice-infested waters will be needed if development is to proceed. Possible missions performed by icebreaking or ice-capable vessels related to oil and gas operations include opening of shipping lanes and drilling vessel sites, protection of drilling operations against drifting ice, supply of operations, pollution response, search and rescue, and transport of petroleum products. In U.S. waters, missions such as supply operations and transport of products are private sector responsibilities. Missions such as pollution response and search and rescue are undertaken by both private and Federal units. The Coast Guard also carries out vessel-towing and other rescue and safety-related missions.

The need for icebreakers will vary with the location of oil and gas fields, their size, and their distribution. Because it is difficult to project what the conditions of oil and gas development will be, projections of future icebreaker needs are uncertain. If fields are close to shore, use of pipelines, aircraft, hovercraft, and land transport over ice would minimize the need for icebreakers. However, in many situations, especially for remote fields, it may be advantageous to use icebreakers. For example, air operations tend to be far more expensive than ship operations, especially for supply tasks involving large volumes. In addition, helicopter range is limited, and aircraft are more limited than ships by weather conditions.

### Federal Icebreaking Services

With the transfer of Navy icebreaking functions to the Coast Guard in 1965, the Coast Guard became the sole Federal agency to operate icebreakers. Apart from its own missions, such as enforcement of laws and treaties, the Coast Guard also provides icebreaking support to other Federal agencies for such purposes as scientific observation and supply of installations. In the early 1980s, Coast Guard polar icebreakers spent an average of 127 days per year in the United States and western Canadian Arctic.[6]

The Coast Guard currently maintains five polar icebreakers (see table 4-2). In terms of numbers, the Coast Guard icebreaking fleet ranks third in the world, behind the Soviet and Canadian fleets (see table 4-3). Private icebreaking services are available in some U.S. Arctic areas. For example, tugboat-pushed barges supply North Slope oil operations, breaking ice each year from August until October.

However, some believe that the Coast Guard has barely adequate resources to undertake current operations and would have inadequate resources to carry out the expanded duties brought about by increased oil and gas development in the Arctic. Apart from the two Polar class ships, the Federal icebreaking fleet is in fair to poor condition (see table 4-4). The U.S. polar icebreaking fleet is one of the the world's oldest, with a median age of about 30 years. Two of the four original Wind class vessels were ret i red several years ago, and the other two still in service have poor crew facilities and defi-

[6]U. S. Coast Guard, "United States Polar Icebreaker Requirements Study" (July 1984), p. A-11.

### Table 4.2.—Coast Guard Polar Icebreakers

| Icebreaker | Year built | Length (ft) | Displacement (long tons) | Shaft horsepower | Icebreaking capability: continuous/ (ft) | ramming (ft) | Complement | Homeport |
|---|---|---|---|---|---|---|---|---|
| Westwind | 1944 | 269 | 6.260 | 10,000 | 3 | 11 | 181 | Mobile, AL |
| Northwind | 1945 | 269 | 6,260 | 10,000 | 3 | 11 | 181 | Wilmington, NC |
| Glacier | 1955 | 310 | 8,678 | 21,000 | 4 | 14.5 | 280 | Long Beach, CA[a] |
| Polar Star | 1976 | 399 | 12,688 | 60,000 | 6 | 21 | 164 | Seattle, WA |
| Polar Sea | 1978 | 399 | 12,688 | 60,000 | 6 | 21 | 164 | Seattle, WA |

[a]To be moved to Seattle, spring 1985

SOURCE. U S Coast Guard

### Table 4-3.—Comparative Government Polar Icebreaker Figures

| Nation | Vessel/class | Built | Length (ft) | Draft (ft) | Displacement (tons) | Shaft horsepower | Power[a] plant | Icebreaking[b] capability (ft) |
|---|---|---|---|---|---|---|---|---|
| U.S.S.R. | Leonid Brezhnev | 1975 | 446 | 36 | 25,000 | 75,000 | N | 8 |
| | Sibir | 1977 | | | | | | |
| | Rossiya | 1985 | | | | | | |
| U.S.S.R. | Lenin | 1959 | 439 | 34 | 19,240 | 44,000 | N | 7 |
| U.S.A. | Polar Star | 1976 | 399 | 31 | 13,000 | 60,000 or | GT or | 6 + |
| | Polar Sea | 1978 | | | | 18,000 | DE | |
| U.S.S.R. | Yermak class (3 ships) | 1974-76 | 442 | 36 | 20,241 | 36,000 | DE | 6 |
| Japan | Shirase | *1982* | 440 | 30 | 17,600 | 30,000 | DE | 5 |
| Canada | Louis St. Laurent | *1969* | 366 | 31 | 14,000 | 24,000 | TE | *4-5* |
| Canada (private) | Kalvik class. (2 ships) | *1983* | 289 | 26 | 7,000 | 23,200 | GD | *5* |
| U.S.S.R. | Moskva class (5 ships) | 1959-69 | 400 | 31 | 15,360 | 22,000 | DE | *4.5* |
| U.S.S.R. | Kapitan Dranitsyn class (2 ships) | 1980-81 | 433 | 28 | 14,900 | 22,000 | DE | *4.5* |
| U.S.S.R. | Kapitan Sorokin class (2 ships) | 1977-78 | 433 | 28 | 14,900 | 22,000 | DE | 4.5 |
| Canada (private) | Canimar Kigoriak | 1979 | 299 | 28 | 6,500 | 16,360 | GD | 4-5 |
| USA | Glacier | 1955 | 310 | 28 | 8,000 | 21,000 | DE | 3.5 |
| Canada | MacDonald | 1960 | 315 | 28 | 9,160 | 15,000 | DE | 3.5 |
| Canada | Radisson class (3 ships) | 1978-82 | 316 | 24 | 8,055 | 13,600 | DE | 3.5 |
| Argentina | Almirante Irizar | 1978 | 391 | 31 | 14,500 | 16,200 | DE | 3.5 |
| Canada (private) | Ikaluk class. (2 ships) | 1983 | 258 | 25 | 6,000 | 14,900 | GD | 3-4 |
| W. Germany | Polarstern | 1982 | 387 | 35 | 14,800 | 20,000 | GD | 3 |
| Japan | Fuji | 1965 | 328 | 29 | 8,566 | 12,000 | DE | 3 |
| Canada (private) | Robert Lemeur | 1982 | 272 | 18 | 6,512 | 9,000 | GD | 3-4 |
| Canada | Labrador | 1953 | 290 | *30* | 7,000 | 10,000 | DE | 3 |
| USA | Northwind Westwind | 1944-45 | 269 | *28* | 7,000 | 10,000 | DE | 3 |

[a]Power plants: N = nuclear; GT = gas turbine; DE = diesel electric; TE = turbo-electric; GD = geared diesel.
[b]Estimated continuous, level icebreaking capability at 3 knots.
[c]This table does not include some 56 vessels (subarctic icebreakers) that are capable of icebreaking operations in seasonally ice-covered coastal seas and lakes outside the polar regions. These ships are owned by Canada (2), Denmark (2), Finland (9), W. Germany (1), Sweden (6), USA (l-Mackinaw), U.S.S.R. (34), and E. Germany (1).
[d]All government-owned icebreakers except for those Canadian vessels noted as Private.

SOURCE: U.S. Coast Guard.

**Table 4-4.—Condition of Coast Guard Icebreaking Fleet**

| Category | Icebreaker type Wind class | Glacier | Polar class |
|---|---|---|---|
| Prime mission equipment/ science facilities | 2 | 3 | 3 |
| Habitability | 1 | 2 | 5 |
| Hull and ship structure | 1 | 3 | 5 |
| Main propulsion | 4 | 3 | 4 |
| Auxiliary | 1 | 3 | 4 |
| Command and control | 2 | 4 | 4 |

5 = excellent; 4 = good; 3 = fair; 2 = poor; 1 = Inadequate

SOURCE: U.S. Coast Guard.

ciencies in steering and firefighting systems. These older icebreakers are considered by the Coast Guard to be nearing the end of their ability to provide reliable service. Their active service is projected to end in the late 1980s.

The Coast Guard currently assumes that it will continue to have an icebreaker fleet of five ships, although it is possible that a four ship system will be adopted. Because of the long lead-times involved in the design, construction, and testing of icebreakers— about 5 to 8 years—decisions must be made soon concerning the number of icebreakers desired and their characteristics (size, draft, propulsion systems, equipment, etc.). Congress has authorized the construction of at least two new Polar class icebreakers by the end of fiscal year 1990.

### Future Icebreaking Needs

Offshore developments in Arctic regions may require icebreaker support for much of the year. Different levels of service could be provided by the Coast Guard. The Coast Guard believes that the continuous presence of Coast Guard icebreakers is not required in the Arctic at this time; rather, it seeks to maintain the ability to enter Arctic waters and perform required missions. If a continuous presence were needed, different icebreaker design and/or more northern icebreaker basing would be required.

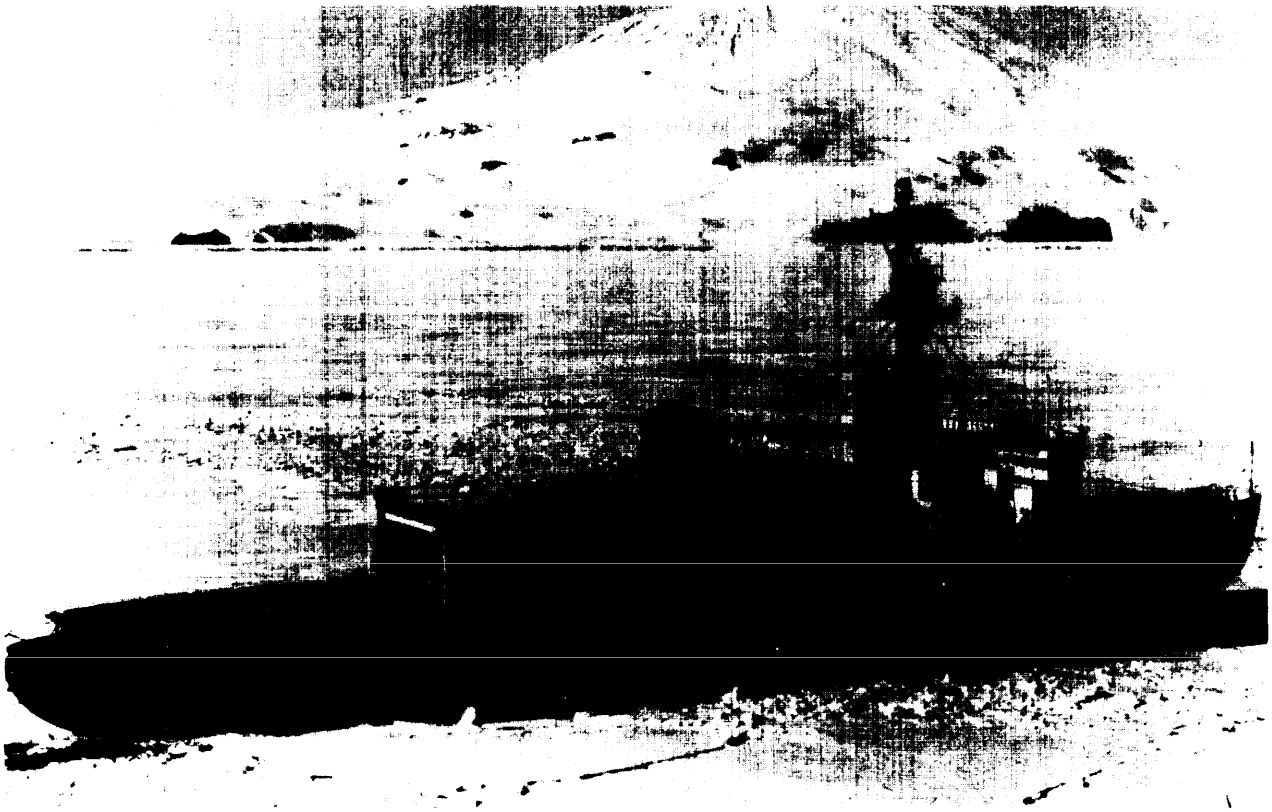


*Photo credit: U.S. Coast Guard*

Coast Guard Icebreaker Polar Sea

The most capable icebreakers in the Coast Guard fleet, the Polar Star and the Polar Sea, are capable of transiting continuously through over 6 feet of first-year ice at 3 knots, without backing and ramming. They can break through ice thicknesses of 21 feet by backing and ramming. There is some disagreement regarding the adequacy of these ships for operations in all Arctic winter conditions. The Coast Guard believes that the Polar class vessels have sufficient characteristics, while some other sources believe that far more powerful icebreakers are needed. If many operations take place in the Beaufort and Chukchi Seas, as opposed to the Bering, icebreakers will have to meet more rigorous requirements. The Coast Guard is currently deciding the class of future polar icebreakers.

A problem for year-round service is the endurance of icebreakers. The gas turbine engines on the Polar class vessels, used for heavy icebreaking, consume large amounts of fuel and require relatively frequent refueling. Even in conditions where diesel electric engines are used, icebreakers that have long traveling times to reach Arctic duty experience endurance problems. The home bases of the polar fleet are Seattle, Long Beach, Mobile, and Wilmington, with two (soon to be three) of the five polar icebreakers based in Seattle. From Seattle to the North Slope is at least a 2-week voyage. Currently, there are no refueling stations north of the Aleutians. If a more substantial Coast Guard icebreaking presence were to be established, vessels with greater endurance would be needed or refueling and other support facilities would have to be constructed closer to offshore operations. One problem with northern basing is that the closer the operations base is to the Arctic, the farther away it would be from Antarctica, where many missions are carried out. It is also thought that ship maintenance would be more difficult if northern bases were used. The Coast Guard has no present plans to establish northern basing for icebreakers.

Some Arctic areas such as the eastern Beaufort are relatively shallow for long distances offshore and shallow draft icebreaking capability may be needed. Such icebreakers must be able to operate in less than 20-foot water depths and to break ice continuously 2 to 3 feet thick.[7] The Coast Guard currently lacks vessels that combine sufficient strength to transit through Arctic ice with shallow enough drafts to come close to shore. The new generation of Polar icebreakers planned for purchase by the Coast Guard will also be deep-draft. The Coast Guard is waiting to see what level of commitment industry will be making to offshore exploration before deciding what type of shallow-draft icebreaking service may be needed.

Icebreakers are expensive to build and operate. Total annual costs of operating four to five icebreakers under various alternatives range from $35 to $50 million. Icebreakers support the missions of a number of agencies besides the Coast Guard, especially the Department of Defense and the National Science Foundation. Participating agencies and groups pay a proportionate share of Coast Guard expenses incurred on icebreaking missions, including pay, maintenance, and fuel costs. Because Coast Guard icebreaking is dependent on the year-to-year operational plans of several agencies, Coast Guard planners face considerable uncertainty. If a single agency decides not to utilize icebreaking services, the Coast Guard may have to withdraw a ship from service. The Coast Guard is currently seeking a revision of the cost-sharing system.

There are also questions about the extent to which icebreaking services should be provided to private firms developing offshore oil and gas. Icebreaking could be a private sector activity, with icebreakers owned and operated by private firms. Or the government could be reimbursed by the offshore oil and gas industry for all or part of its services.

No Federal icebreaking assistance is provided routinely to North Slope commercial operations. The position of the Coast Guard is that responsibility for routine icebreaking for marine commerce rests primarily with the marine industry and not with the Federal Government. However, if available commercial icebreaking services are inadequate, the Coast Guard will provide icebreaking assistance. Decisions on the availability and adequacy of commercial services are made by Coast Guard District Commanders.

There is a need for the Coast Guard to continue icebreaking services in support of such statutory mandated missions as search and rescue, emergency response, enforcement of laws and treaties,

[7]Lawson W. Brigham, "Future U.S. Coast Guard Shallow-Draft Icebreaker Requirements in Alaska, *Proceedings of the Symposium on Science and Arctic Hydrocarbon Exploration: The Beaufort Experience* (September 1983).

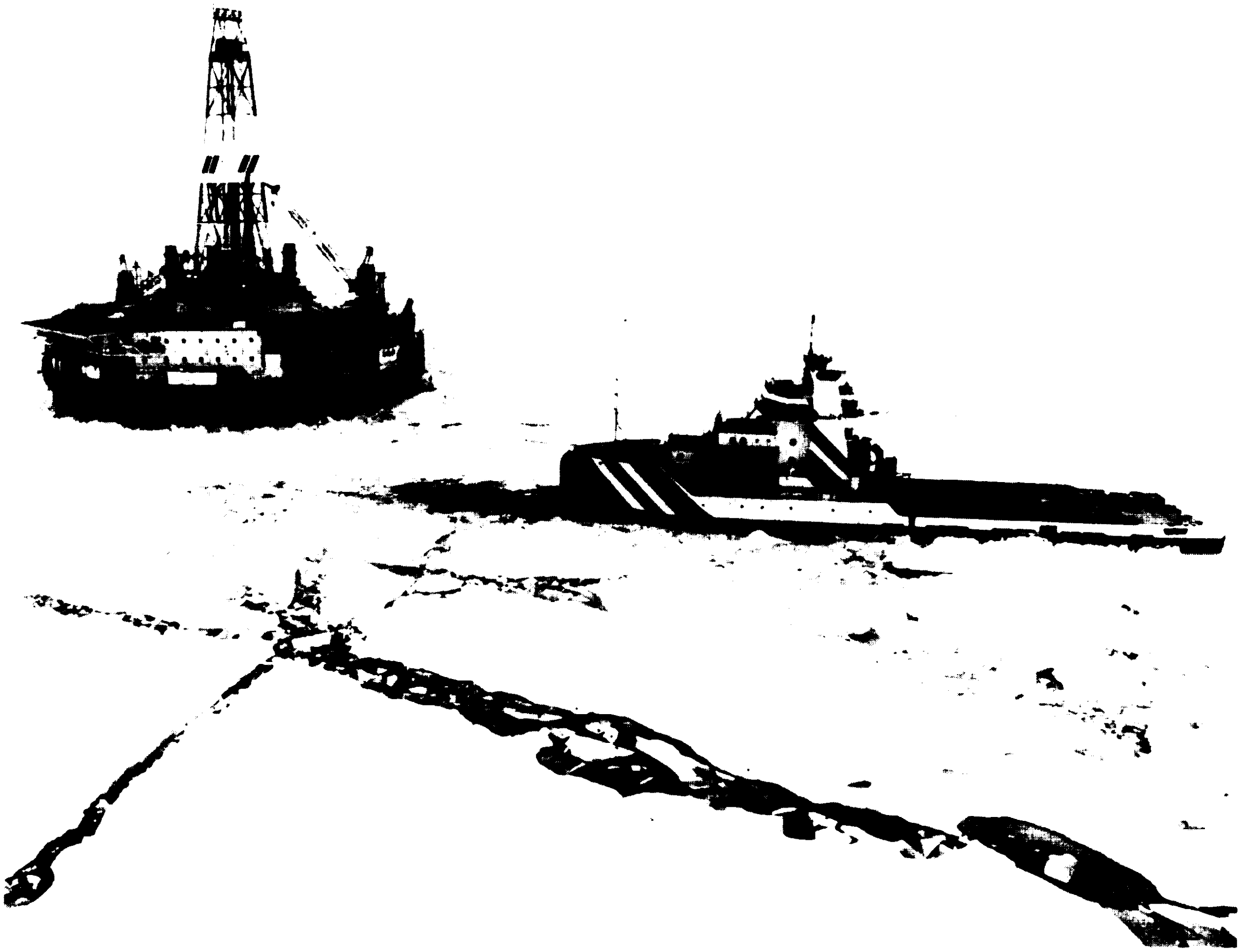


*Photo credit: Gulf Canada*

Floating conically-shaped mobile drilling unit "Kulluk" operating in the Canadian Beaufort Sea with icebreaker support

and pollution response. However, private operators feel that they can provide the offshore oil and gas industry icebreaking services such as supply and channel breaking. At the present time, there are few U.S. private sector icebreakers, and current capabilities are limited to the summer months. As oil and gas development proceeds, these capabilities may expand. The Coast Guard would probably still be called upon for icebreaking support in emergency ice conditions.

There are incentives for industry to provide its own icebreaking or contract with private firms for icebreaking services to support oil and gas development. Special Coast Guard requirements for larger ships increase the cost of Federal icebreakers and icebreaking services in comparison with private services and would add to any Federal user fees. Also, without the need to design and operate vessels for the multi-mission roles that Coast Guard vessels must fulfill, private sector icebreaking vessels could be tailored to meet industry missions.[8]

In general, private icebreaking firms have been strong supporters of user fees, believing that they could not compete against taxpayer-subsidized Coast Guard services. The Coast Guard advocates

[8]National Petroleum Council, *U.S. Arctic Oil and* Gas, Working Paper-26 (December 1981), pp. IV 52-54.

assessing any user fees only for activities beyond the statutory responsibilities of the Coast Guard. Coast Guard policy for the Arctic is not clearly established and may not be until there is increased oil and gas development. A 1982 interagency study declared that ' 'although Arctic petroleum development could be argued to be in the national interest, the services of Coast Guard icebreakers to facilitate commerce could be argued on the other hand to be a free subsidy to the petroluem industry. Presently there are no plans for Coast Guard icebreakers to be used to directly support petroleum exploitation and commerce. If such support were provided, it would be appropriate for user fees.

'Department of Transportation, ' 'Coast Guard Roles and Missions'' (March 1982), p 157.

# SAFETY

Offshore oil and gas operations entail hard and dangerous work. Special risks are presented in frontier regions because of harsh environments and remote locations. Offshore operators have made substantial efforts to safeguard health and safety, and the safety record of offshore operations appears equal to or better than the record of comparable onshore industries. Still, there is a need for continuing attention to ways in which the Federal Government can assist in preventing work-related injuries and fatalities.

As in other industrial sectors, offshore employers vary greatly in their safety records. Industry associations and many employers have strongly promoted safety, e.g., through sponsoring training of personnel, while other employers have been more lax. Public concerns about offshore operations have been stimulated by incidents that resulted in the death of a large number of workers. The best known of these incidents are the sinkings of the converted floating hotel Alexander Kielland (North Sea 1980, 123 fatalities), the Ocean Ranger (Eastern Canada 1982, 84 fatalities), and the drill ship Glomar Java Sea (South China Sea 1983, 81 fatalities). The last two were U.S. flag casualties. Offshore incidents in 1984 included a fire on the Enchova Central Platform off Brazil with 41 fatalities, and a natural gas explosion that killed 4 on the Zapata Lexington Number 26 semi-submersible rig in the Gulf of Mexico.

Offshore hazards can be categorized in different ways. A Marine Board report separates hazards according to the *type* of offshore activity: construction, drilling and well maintenance, production, and transportation.[10] Exploratory drilling is often considered to be the most hazardous phase of offshore operations, perhaps because less is known at that stage about formation characteristics. Only about one-fifth of all offshore employees are engaged in drilling; however, they experience a disproportionately larger number of accidents.

Accidents can also be categorized according to the ***facility*** where they occur: tankers, fixed platforms, mobile rigs, and support vessels and structures.[11]

Another division emphasizes the scale of accidents. There are individual accidents, such as falls, being struck by objects, and being pinned between objects. There are also occupational health problems separate from accidents, such as hearing loss due to machinery noise. Then, there are larger scale, catastrophic incidents, such as rig sinkings. Catastrophic incidents have occurred because of storms, structural failures, and capsizings. Other fatalities have resulted from well blowouts, explosions, and fires. Unlike most onshore occupations, offshore jobs pose hazards to off-duty workers, who often remain in close proximity to the work-site. Multiple fatalities and injuries also have resulted from transportation accidents involving helicopters and supply vessels.

This section focuses on several potential safety problems present in frontier regions. In general,

[10] Marine Board, *Safety and **Offshore** Oil* (Washington, DC: National Academy Press, 1'981 ), pp. 142-143.
[11] MITRE Corp. , *Health and Environmental Effects Of Oil and Gas Technologies: Research **Needs*** (July 1981), p. viii.

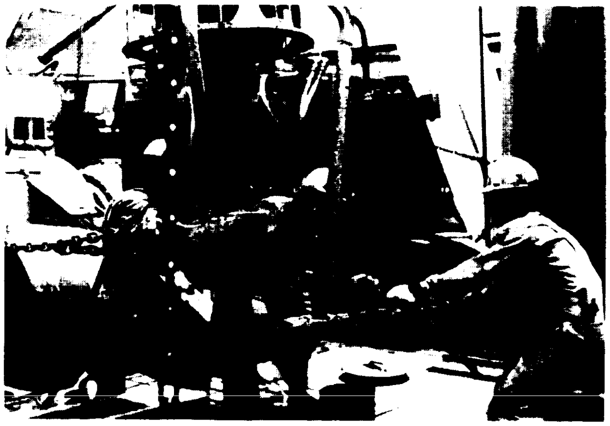


*Photo credit: Peter Johnson, OTA*

Roughnecks on the drilling rig floor at Shell's Seal Island discovery in the Beaufort Sea

the same types of offshore operational hazards are present no matter where operations take place, from the day-to-day dangers of working with machinery in confined spaces to unusual events such as evacuation under storm conditions. The high levels of investment required in frontier areas and the involvement of larger companies with relatively well-organized health and safety programs may make the future safety record of operations in such areas comparable to operations in more benign regions. Still, other things being equal, frontier conditions compound operational risks.

The environmental conditions in offshore frontier areas—extreme cold, ice, extended periods of darkness, blizzards and fog in the Arctic and severe storm conditions in the sub-Arctic and many deepwater areas—increase the dangers of operations. The remote location of many rigs in frontier areas makes evacuation of personnel more time-consuming and difficult, and delays medical treatment. The cold temperatures found in the Arctic and other northern regions are hazardous both in their direct effects on human health and in their reduction of worker efficiency. Although employees usually work in heated areas, at times they are exposed to cold. Human ability to perform tasks (e. g., in terms of reaction time) declines with decreasing temperature.[12] Bulky protective clothing worn for warmth may interfere with tasks in ways that cause injury risks to increase.

In situations where quick rescue is impossible, exposure suits are essential to survival in cold water. The time it takes for severe hypothermia and subsequent death to occur varies with such factors as water temperature, the weight and physical condition of the person in the water (thinner people suffer quicker heat loss), the type of clothing they are wearing (heavier clothing provides greater insulation), and the person's behavior (e. g., curling up in a fetal position decreases the rate of heat loss). Without an immersion suit, even a heavily clothed person in good physical condition can survive for only a few hours in winter seas. More lightly clothed people die from hypothermia in much less time. With a suit, survival time is increased many-fold. A major factor contributing to the deaths resulting from the Ocean Ranger disaster was the lack of exposure suits on board. Within a few minutes of entering the water, personnel were too numb to grasp life ropes and rings thrown to them from the rescue vessel. A Coast Guard rule went into effect in August 1984 requiring exposure suits for personnel on mobile offshore drilling units, among other types of vessels, that are located in specific offshore areas.

## *Injury and Fatality Statistics*

There is currently no single comprehensive source of statistics on U.S. offshore accidents, and there are no reliable injury and fatality rate statistics for offshore operations beyond those compiled by the International Association of Drilling Contractors (IADC) for individual workplace accidents in offshore drilling. The lack of data makes it difficult to evaluate the level of safety achieved by oil and gas operators, safety-related equipment, and Federal regulation. It also makes it difficult to assess the effects on safety when changes are introduced. The data bases that do exist do not separate incidents that occur in frontier regions. To date, there have been no major (catastrophic) accidents in U.S. frontier areas. However, such accidents have occurred to U.S. facilities in other areas.

Several different agencies and organizations keep offshore accident records, using a variety of reporting systems. The Coast Guard requires accidents

[12] R. Goldsmith, ' 'Cold and Work in the Cold, " *Encyclopedia of Occupational Safety and Health* (Geneva: International Labor Organization, 1983).

to be reported if they result in an injury causing absence from work for more than 72 hours. The Bureau of Labor Statistics (BLS) collects data on those accidents which cause the employee to be unavailable for work at the beginning of his next workday. The IADC collects data on accidents which cause 12 hours of work to be lost.

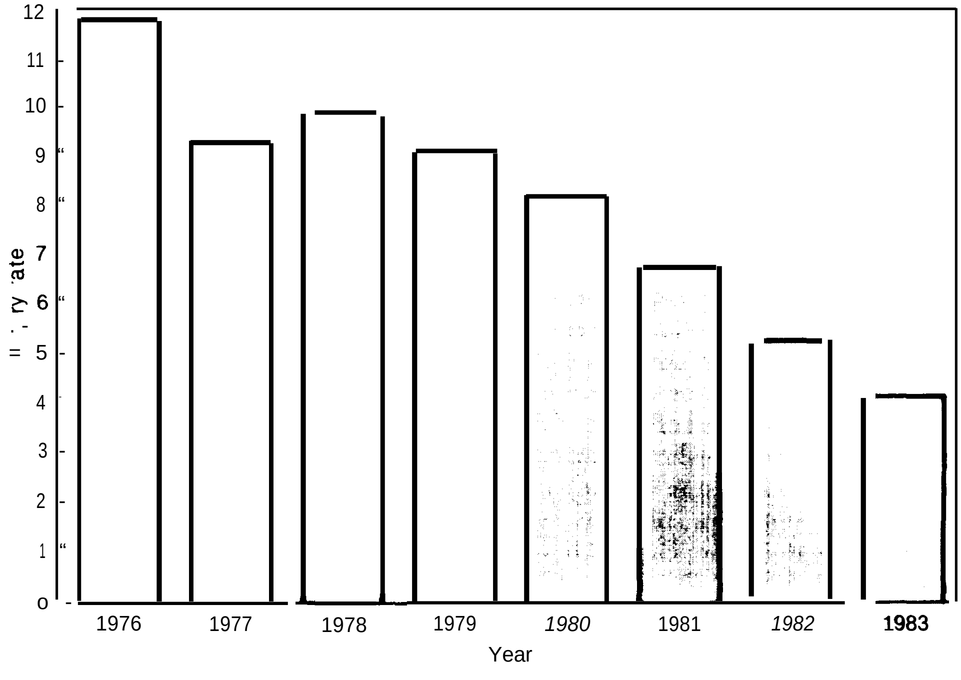
The BLS and IADC standards are roughly comparable, but their statistics often differ due to different data bases. For example, IADC usually reports drilling-related injuries, while BLS covers all aspects. IADC statistics are derived from companies employing about 90 percent of the offshore drilling workers, while BLS relies on statistical sampling. In addition, the IADC does not include accident statistics from catastrophic incidents or accidents involving personnel not employed by drilling contractors, such as oil company representatives and employees of firms providing drilling muds, well cement, or specialty tools. Neither the IADC nor the Coast Guard ordinarily include statistics on accidents and fatalities for helicopter personnel transfer and resupply operations, unless the helicopters and supply vessels collide with offshore facilities.

### Injury Rates

Available data indicate that offshore injury rates have declined in recent years (see figure 4-2). IADC figures show the accident rate for offshore drilling has been declining since 1976 equaling a reduction of over 60 percent. However, the IADC reported an increase in the incidence of injuries for the first 9 months of 1984 as compared with 1983. Overall, offshore drilling injury rates are comparable to those in the mining sector and are less than onshore drilling injury rates (see table 4-5).

Using a 72-hour reporting standard and ending with 1981, Coast Guard data show a similar trend for the offshore industry since 1978. According to the Coast Guard, over 80 percent of OCS injuries are caused by human factors, rather than equipment failure. A major cause of accidents is inexperience: about 75 percent of the injuries occur to workers with less than 1 year on the job, and about

**Figure 4-2.—Offshore Drilling Injury Rate**




Injury rate equals the incidence of lost time accidents per *200,000* man-hours.

**SOURCE: International Association of Drilling Contractors**

**Table 4.5.–Comparable Industry Injury Rates (1983)**

| Industry | Injury rate per 200,000 manhours |
|---|---|
| Total private sector | 3.4 |
| Construction | 6.2 |
| Mining (other than oil and gas extraction) | 4.4 |
| Anthracite mining | 6.1 |
| Total oil and gas extraction: | 4.6 |
| Onshore oil and gas drilling | 10.36* |
| Offshore oil and gas drilling | 4.2* |

"Statistics from IADC.

SOURCE: Bureau of Labor Statistics.

30 percent to workers with less than 6 months experience. However, some workers contend that some accidents listed as being caused by human error are the result of unsafe management practice rather than worker carelessness. In boom periods, when operations expand, there is an influx of new workers, and accident rates increase. In slack periods, only more experienced workers are retained.

### Fatality Rates

There are fewer reliable statistics on offshore fatality rates. Unlike offshore injuries, the data available show no clear pattern of decline in fatalities. Coast Guard data show the fatality rate (deaths per 210 million man-hours) for offshore drilling fluctuating between 1976 and 1981, with a high of 226 and a low of 80. Fatality rates for the offshore oil and gas industry as a whole fluctuated between a high of 118 and a low of 54 in this time period. The reliability of these statistics is unclear, as the Coast Guard lacks data on man-hours worked.[13]

The Coast Guard is seeking to establish an improved injury and population data collection system. One change will be the collection of data in computer form. Perhaps the most important improvement sought is better information on the number of workers and the hours worked offshore. This is necessary to monitor progress towards the Coast Guard and Federal goal of decreasing injuries and fatalities. If a new permanent data collection system cannot be implemented, the Coast Guard hopes to make a comprehensive assessment of injury and population data in 1988. The last statistical assessment of offshore injury and fatality rates made by the Coast Guard was in 1982.

Consistency among data systems would aid in evaluating the effectiveness of safety measures. A report by the Marine Board of the National Research Council recommended several improvements in the present inspection and data system, including the formation of a system that acquires comprehensive event and exposure data; relates events to specific employers, locations, operations, and equipment; calculates frequency and severity rates, and analyzes trends; and permits monitoring of the relative safety performance of owners and employers, locations, and activities.[14]

The Marine Board also concluded that a single lead agency should be established to handle safety data and recommended MMS in this role. MMS was seen by the Marine Board as having a stronger presence offshore than other agencies, and it believed that MMS would better integrate safety data into day-to-day regulation. On the other hand, the Coast Guard is also a strong candidate since it has the bulk of the offshore personnel safety-related responsibilities.

## Safety Regulation

### Offshore Regulatory Structure

Under the OCS Lands Act and its regulations, private industry is responsible for ensuring the safety of offshore operations:

> Each holder of a lease or permit under the Act shall ensure that all places of employment within the lease area or within the area covered by the permit on the OCS are maintained in compliance with workplace safety and health regulations of this part, and, in addition, free from recognized hazards . . . . Persons responsible for actual operations, including owners, operators, contractors, and subcontractors, shall ensure that those operations subject to their control are conducted in compliance with workplace safety and health regulations of this part and, in addition, free from recognized hazards.[15]

[13] Testimony of Thomas Tutwiler, Hearing before the Subcommittee on Panama Canal/Outer Continental Shelf of the Committee on the Merchant Marine and Fisheries, House of Representatives (June 16, 1983)

[14] Marine Bored, *Safet, In formation and Management on the Outer Continental Shelf* (Washington, DC: National Academy Press, 1984).

[15] 33 CFR Sections 142. l(a) (b).

Private industry responsibility for safety is governed by a complex regulatory structure. Depending on where they are located, offshore facilities are affected by several sets of mandatory and voluntary authorities and standards. These include international agreements and conventions, flag nation standards, coastal nation standards, and nongovernmental organizations.

The International Maritime Organization (IMO), whose membership includes most of the world's maritime nations, sets standards on marine safety, pollution, and navigation. IMO member states have adopted many of these standards as minimum requirements, supplementing IMO standards as deemed necessary with their own regulations. The International Labor Organization also has recommended safety standards in consultation with IMO. Among other related actions, IMO has published a Code for the Construction and Equipment of mobile drilling units (1979) and a convention on Safety of Life at Sea (SOLAS) (1974), which contain man y safety recommendations. Recent SOLAS lifesaving requirements include provision of above-water means of escape from enclosed lifeboats in case of flooded capsizings, lifeboat release mechanisms that permit both on-load and off-load releases, and requirements for training on use of all survival equipment, including life rafts.[16]

The nation under whose flag a given mobile drilling unit is registered has its own set of regulatory authorities governing design, construction, and operation of rigs and their equipment. The nation off whose coasts a rig is operating may have jurisdiction over aspects of operation. In addition, state or provincial governments may have additional standards.

Nongovernmental organizations such as the American Bureau of Shipping (ABS) conduct design and construction review and surveys for ships, rigs, and other marine equipment. Most insurance underwriters require classification by societies such as ABS before they will insure a ship or rig. The Coast Guard accepts certain ABS inspections in lieu of direct Coast Guard inspection. Other U.S. private organizations with notable roles include the IADC, which collects accident statistics and advises members on safety matters; the American Petroleum Institute, which publishes standards and recommended practices for facility and component design, construction, and operation, as well as personnel training; the Underwriters' Laboratories, which performs classification and testing for such things as fire protection systems; and the American Society of Mechanical Engineers, which publishes industry codes for piping and pressure vessels.

### Federal Safety Responsibilities

The OCS Lands Act gives primary offshore safety responsibilities to the Coast Guard and MMS. The Coast Guard is the lead agency for personnel protection, and enforces most regulations controlling workplace safety. MMS enforces regulations bearing on safety as part of its responsibility for the regulation of drilling and production. Both the Coast Guard and MMS have responsibilities for reviewing the design and construction of facilities. MMS also evaluates installation of fixed facilities to ensure that they are in compliance with plans and that no significant damage has occurred during installation.

Both agencies have regulations covering training, drills, and emergency procedures on offshore facilities. Each agency has provisions for conducting scheduled and unannounced inspections to ensure compliance. The Coast Guard is normally the lead investigating agency for cases of collisions, deaths and injuries, damage to floating facilities, and failures of or damage to propulsion, auxiliary, emergency, and other safety-related systems. MMS is the lead agency for cases of fires and explosions, pollution, and failure of or damage to fixed facilities. For incidents where they do not have lead agency responsibility, each agency participates in any investigation that bears on its jurisdiction.

Other agencies with offshore safety roles include the Occupational Safety and Health Administration (OSHA) and National Institute of Occupational Safety and Health (NIOSH). Memoranda of Agreement have been signed between agencies delineating jurisdictions. The Memorandum of Understanding between the Minerals Management Service and the Coast Guard gives authority for regulating specific operations dealing with drilling to MMS, and other aspects of OCS operations to the Coast Guard.

[16] Robert L. Markle, "SOLAS Chapter III, *Proceedings of the Marine Safety Council* (January 1984).

### COAST GUARD

Coast Guard regulations deal with hazardous working conditions offshore and apply to the performance of safety-related equipment and drills for personnel for the evacuation of facilities. The Coast Guard reviews and approves design, construction, alteration and repair for vessels, rigs, and floating facilities. The Coast Guard also regulates the safety of commercial diving operations.

The Coast Guard is in the process of modifying safety standards for mobile offshore drilling units, fixed structures, and mobile well servicing units. For mobile offshore drilling units, revisions are being considered regarding ballast control, fire protection, and lifeboat and life raft launching under adverse conditions. One proposal would require that a mandatory safety briefing be given to each arrival on board. Other regulatory changes under consideration would apply to fixed as well as mobile facilities.

Other possible changes include: 1) expanding regulations to more specifically cover support units, such as specialized vessels used for standby, supply, and well servicing; 2) expanding workplace safety rules, including personal protective equipment, and guarding of openings; 3) clarifying division of responsibility with OSHA; 4) updating evacuation and firefighting standards; 5) clarifying best and safest technologies (BAST) regulations; and 6) clarifying training requirements.

The Coast Guard also conducts research to improve prevention of offshore work-related injury and illness. Investigations are being conducted on such things as improving the seakeeping characteristics of mobile offshore drilling units. Current research contracts include investigation of ballast systems, tension leg platform design and serviceability, and methods for evacuation of Arctic drilling units.

### MINERALS MANAGEMENT SERVICE

MMS, the lead offshore Federal agency, has the power to halt operations or even cancel a lease if it determines that such operations constitute a sufficient hazard. MMS issues OCS Orders for each region that cover such things as well control, production safety systems, pollution prevention and control, and structural safety. Lessees have to show compliance with the orders to obtain permits to drill and produce.

MMS conducts technical reviews and approves design, fabrication, and installation of all fixed OCS facilities. For floating facilities, MMS has approval of the design and fabrication by the Coast Guard. MMS also conducts inspections of facilities to check for compliance with regulations and is the lead agency for the investigation of accidents involving fires, blowouts, and explosions. MMS regulation is done primarily through working with the operator/lessee rather than with contractors or subcontractors.

During inspections, MMS technicians monitor testing of drilling safety equipment, check to see that required equipment is in place, and review records to verify that periodic tests have been performed. Violations can be punished with a warning or order to shut down the operation.

### SHARED COAST GUARD/MMS RESPONSIBILITIES

Both the Coast Guard and MMS review design, construction, and installation of offshore facilities. Which agency will be responsible for a given facility depends whether it is fixed on the seafloor or floating. Some facilities may require both Coast Guard and MMS approval, due to their change in character from being a floating facility while in transit to the site to being fixed when on site. The tension leg platform is even more complex. The surface portion and the legs are approved by the Coast Guard while the ocean floor foundation is the responsibility of MMS.

MMS design verification and fabrication inspection are largely conducted by approved third-party verifiers who, while paid for by the construction or operating company, verify to the responsible agency that the facility meets regulatory requirements, An inspection of fixed structures during or immediately after construction or installation is a part of the third-party verification system. Post-installation underwater inspections are not required in subsequent years, but may be needed, particularly in frontier areas.

Post-installation inspection requirements of the legs or the underwater portion of the floating structure of the tension leg platform have not been determined. However, other floating structures certified by the Coast Guard such as mobile drilling units and ships generally undergo a regular docking for inspection. MMS announced its intention in 1980 to develop requirements for periodic structural inspection of fixed offshore facilities.

As new concepts evolve, certification responsibilities may change and certification procedures may be blurred. For example, ocean sub-sea completion systems and future ocean floor production facilities may require different arrangements. The government's regulatory role in the inspection of underwater portions of the structure during the life of the structure is now limited,. The government does require structural integrity data from industry after a platform has been installed and is subjected to a major event, such as a storm or collision. As structures become more complex and are located in deepwater or Arctic areas, inspection techniques must also become more sophisticated. Government-sponsored research may be necessary to enhance Federal inspection capabilities for the future.

OTHER FEDERAL AGENCIES

The Memorandum of Understanding between OSHA and the Coast Guard states that the Occupational Safety and Health Act (which is enforced by OSHA) applies to offshore working conditions, but ' 'does not apply to working conditions with respect to which the Coast Guard or other Federal agencies exercise statutory authority to prescribe or enforce standards affecting occupational safety and health." OSHA enforces standards in State waters out to the 3-mile limit (out to 9 miles for Texas and Florida), except in California and Alaska, which administer federally approved safety and health programs. OSHA does not conduct separate offshore inspections. If Coast Guard inspectors detect violations of OSHA standards in the course of inspections, they notify OSHA. The two agencies have agreed to coordinate activities and exchange data in areas where they may overlap. OSHA turns over to the Coast Guard all worker safety and health complaints, while Coast Guard makes available to OSHA the results of Coast Guard accident investigations. OSHA is proceeding with rulemaking to improve workplace standards for onshore oil drilling and servicing, which could be useful to offshore operations.

Other Federal agencies with lesser roles include NIOSH, U.S. Department of Health and Human Services; and BLS of the U.S. Department of Labor. NIOSH does research related to preventing work-related injury and illness. They have sponsored research on diving hazards and on identifying injury causal factors on drill rigs. They have recently released recommendations for protecting workers on land-based drill rigs which may partly apply to offshore drilling operations. The BLS is responsible for collecting and reporting statistics for work-related injury and illness.

## *Arctic Search and Rescue*

Offshore development in the Arctic presents special safety problems. Ice, extreme cold, occasional white-outs and fog, and possibly, long distances from human settlements, make evacuation difficult. It is uncertain how evacuation will be conducted from rigs surrounded by ice. Conventional lifeboats and land capsules cannot be used. For the near future at least, helicopters, suitable fixed-wing aircraft, and/or icebreaking ships will have to be maintained by private or Federal sources. Because of lack of Federal resources, it is likely that offshore developers will have primary responsibility for their own rescue efforts.

The Coast Guard is the lead Federal search and rescue agency in maritime regions. It coordinates its efforts with those of other Federal agencies, especially the Department of Defense, and with State and local governments and the private sector.[17] In addition, the Coast Guard reimburses fuel expenses for the Coast Guard Auxiliary, a volunteer organization that performs about one-fifth of Coast Guard search and rescue missions. The Air Force is lead agency for search and rescue in land areas and is frequently called on for maritime search and rescue. The Air Force also operates the Mission Control Center at Scott Air Force Base, Illinois, through which Search and Rescue Satellite Aided Tracking (SARSAT) rescues are coordinated. Many rescues have been made through the Civil Air Patrol and Coast Guard responding to SARSAT information,

SARSAT is a search and rescue package mounted on one NOAA polar orbiting meteorolog-

[17] U.S. Coast Guard, "National Search and Rescue Plan" ( 1981).

ical satellite. Three Soviet cosmos satellites in the COSPAS system also have search and rescue sensors. Eventually, the system will probably consist of two U.S. and two Soviet satellites. As of December 1984, over 300 people have been rescued as a result of COSPAS-SARSAT in the brief period of time in which these satellites have been in operation. About half of these people were U.S. citizens.

SARSAT detects emergency signals from small inexpensive transmitters activated on ships, aircraft, and other vessels in distress. SARSAT offers many advantages, especially in remote areas such as the Arctic, where ship and aircraft passages are infrequent and they may not be found when in distress. Locating vessels is much faster if they are equipped with SARSAT transmitters. However, the Administration has proposed placing SARSAT aboard LANDSAT or another satellite and its future is uncertain.

Some deficiencies have been identified in Coast Guard capabilities to carry out search and rescue missions. Problems include age of vessels, lack of adequate maintenance, lack of training of personnel, excessive overtime required of personnel, and problems in retaining experienced personnel. Personnel policies that have increased the concentration of Coast Guard officers in desk jobs and decreased rotation have been criticized as lessening the amount of experience officers would otherwise gain in search and rescue.[18]

[18]Congressional Research Service, "The U.S. Coast Guard (Mar. 1, 1982).

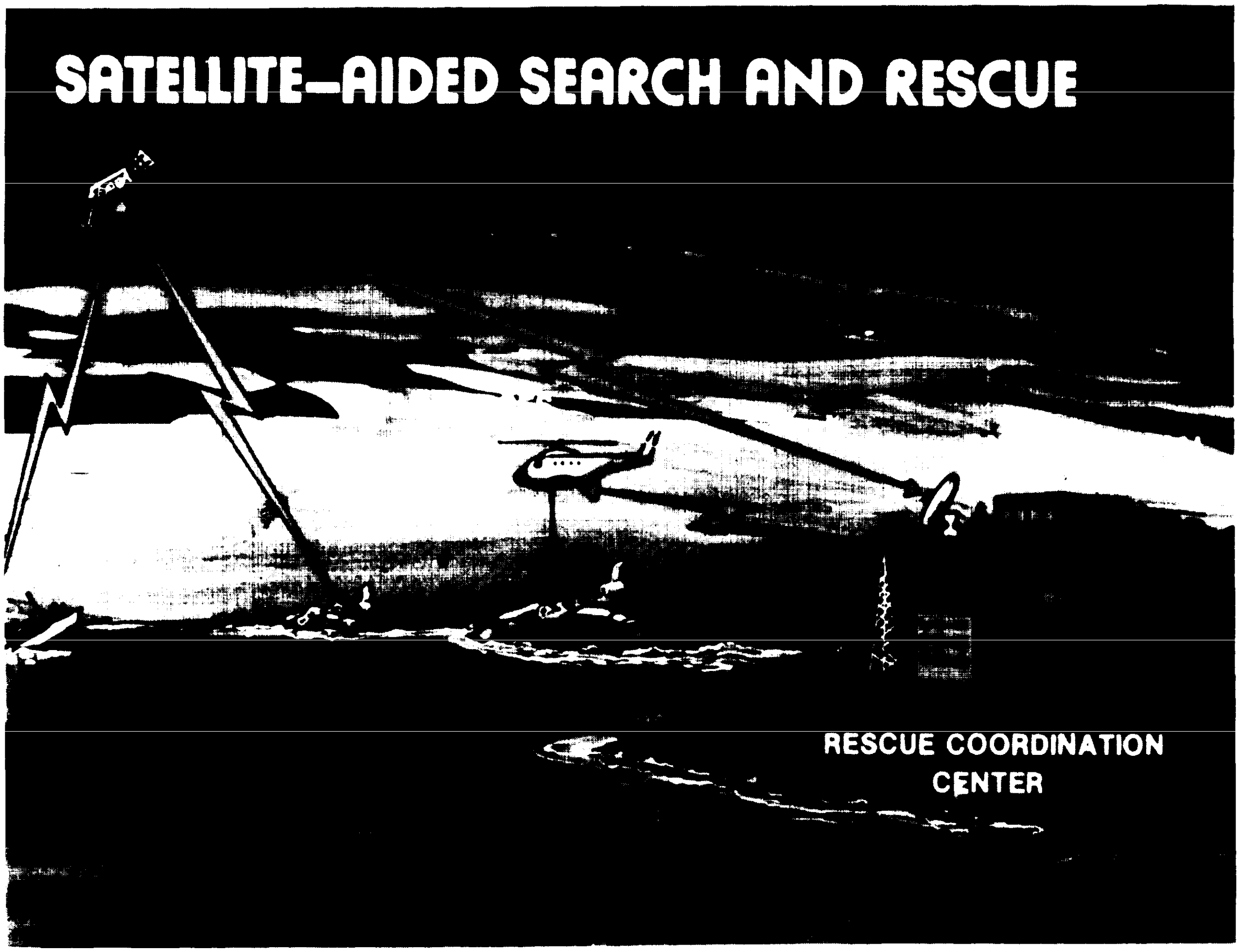



Photo credit: NOAA

The Soviet Union and the United States cooperate in satellite search and rescue in the Arctic

There has been little demand for Arctic search and rescue, due to the lack of commercial and recreational activities in the region. It is reasonable to assume that given expansion of Arctic offshore activities, incidents requiring some search and rescue operations will increase.

However, Coast Guard search and rescue capabilities are constrained in the Arctic. All Coast Guard units in the 17th District are located far from Arctic offshore areas—the closest unit is a small LORAN station at Port Clarence, about 400 miles from Barrow-and all of the major units are on the other side of the State. The ice-strengthened vessels stationed in Alaska are designed for light ice conditions. No unit has icebreakers capable of transiting ice 3 feet and greater in depth, as would be essential for search and rescue during most of the year in northern Alaskan waters. The nearest such vessel, the Polar Sea, is in the Arctic approximately 5 months out of the year (February through April and September through November). At other times, it is based in Seattle, Washington, several days voyage from offshore Arctic sites.[19]

Due to the distance of Coast Guard stations from Arctic operations, lack of permanently stationed icebreakers, and lack of icebreakers capable of winter-round operations, current Coast Guard Arctic search and rescue efforts depend largely on air operations out of Kodiak, Alaska. Air operations are limited by darkness and weather conditions.

The Coast Guard currently has no plans to establish a more permanent Arctic presence, and many search and rescue tasks in the Arctic will be performed by industry itself rather than by the Coast Guard. Industry vessels and helicopters positioned in northern Alaska will have swifter response times than Coast Guard units. Several industry helicopters are already available at Prudhoe Bay. The Coast Guard will coordinate search and rescue efforts of various entities when appropriate.

## *Improving Offshore Safety*

There are economic incentives for the industry to prevent accidents, which can mean time lost from operations and money spent defending against lawsuits. Insurance rates reflect safety records and insurance costs can become exorbitant as a result of bad safety records. Industry believes that more government regulations are not needed to improve safety and that the industry is already overregulated. The Marine Board of the National Research Council concluded that:

> . . . current technology and engineering systems now in use on the OCS appear to provide adequate workplace safety . . . there is no evidence that additional regulations regarding workplace safety are needed for frontier areas nor that major developments in workplace safety technology are indicated. 20

However, the Marine Board and others have pointed out possible improvements that could be made in technologies, training, management techniques, and regulation to improve offshore safety. What constitutes a reasonable level of safety, and what costs are reasonable to reach that level, is a subjective decision. Improvements to workplace safety are possible in at least three areas: 1 ) evacuation, 2) management, and 3) regulation.

### Evacuation

Offshore rigs may carry several types of craft for evacuation of personnel in emergency situations. These include life boats, survival capsules (a type of covered lifeboat designed for heavy seas), and inflatable life rafts. With the exception of life rafts, these craft are generally boarded on the rig and then lowered into the water. While there have been many safe evacuations, it is often difficult to launch these craft from offshore rigs. Factors such as high winds, heavy seas, height above water (craft may have to be lowered 50 or more feet) and awkward positioning (rigs may be listing 10 or more degrees at the time of evacuation) make the launch hazardous. In some cases, such as the Alexander L. Kielland and Ocean Ranger, evacuation craft have been battered against structures, killing and injuring personnel. Though all launching systems are vulnerable to weather conditions, new systems utilizing free-falling boats reduce launching dangers by removing personnel more swiftly and placing them further away from rigs.[21]

[19] Marine Board, ' 'U.S. Capability to Support Ocean Engineering in the Arctic" (January 1984)

[20] Marine Board, *Safety and Offshore Oil*, p. 15

[21] Det Norske Veritas, "Evacuation of Personnel by Sea' (August 1983), pp. 11-13.

Facilities surrounded by ice have special evacuation problems. Different methods of evacuation from those used on water are being investigated, including air-cushioned vehicles and vehicles using Archimedean screw propulsion. While these systems are suitable for some ice conditions, they have problems, including difficulty in negotiating steep pressure ridges. The Coast Guard is now testing a Norwegian free fall system, and should soon issue an approval which would allow rig owners to install the system. Another system utilizing ramps to direct survival craft away from rigs is still in the conceptual stage.

Personnel can also be evacuated from offshore structures, lifeboats and other craft, and from the water itself by helicopter, standby vessel, or a ship dispatched from shore. Legislation has been introduced to require that standby vessels be stationed nearby offshore facilities. Vessels not stationed in the immediate vicinity could not arrive quickly to assist at isolated facilities, and even helicopter rescue may take a long time, depending on the location of facilities in distress and of the helicopters themselves. (If standby ships are not stationed close by, they suffer the same disadvantage. The standby ship for the Ocean Ranger was 8 miles away at the time it was radioed for assistance. ) Helicopters may not be able to operate in severe weather conditions and are less suitable for evacuating divers suffering decompression injuries. The psychological reassurance brought to personnel by knowledge that a boat is nearby also may be considered.

Standby vessels are required in Norway, Great Britain, and Canada. In the United States, standby boats are not required by regulation but are stationed voluntarily by some employers. Standby vessels may not always be the most appropriate means of evacuation. For example, helicopters can take injured people to shore more quickly than can a ship and are not impeded by sea states. In some ice conditions, aircraft, icebreakers, or ice-strengthened rescue ships would be necessary. A Norwegian governmental commission investigating the Alexander L. Kielland incident concluded that the Norweigan requirement that standby vessels be stationed be abolished in favor of regulatory flexibility. 22

[22]Olav Kaarstad and Egil Wulff, *Safety Offshore* (Oslo, Norw arry: Universitetsforlaget, 1984), p.5

Separate investigations of the Ocean Ranger sinking by the National Transportation Safety Board and the U.S. Coast Guard Marine Board of Investigation recommended that the Coast Guard require owners or operators to provide standby vessels. The Coast Guard Commandant, however, did not concur. Coast Guard regulatory revisions will rule on standby vessels. 23

The safety of evacuation methods might be best advanced through performance requirements. Without specifying a system, employers could be required to provide adequate means to evacuate personnel within a certain time. Performance standards have the advantage of increasing the flexibility of employers in meeting requirements. The Coast Guard plans to increase use of performance standards in several areas, using industry standards as a guideline.

Even if rescue ships or helicopters arrive swiftly, they may not be able to recover personnel without specialized equipment. In the case of the Ocean Ranger, standby ships were unable to rescue anyone despite courageous attempts, mostly due to the lack of nets, baskets, cranes, or other systems which could be used to recover persons too weak to assist themselves. Other problems discovered in the course of investigations of the Ocean Ranger incident included design limitations of the standby ships (e. g., high freeboard), lack of training and protective clothing for their personnel, and lack of facilities for treating hypothermia.

Injuries also occur in the course of transferring people between offshore structures and standby boats. Usually, personnel are transferred using baskets or nets suspended from cranes. Extendable, flexible bridge concepts are being explored by some sources.

### Management

Responsibility for safety is not always clearly delineated on offshore rigs. A common practice has been for Toolpushers (drilling supervisors) to be formally in command while rigs are anchored, while Masters (maritime captains) are in command while the rig is being moved. In addition, a representa-

[23]U.S. Coast Guard, *Mobile Offshore Drilling Unit (MODU) Ocean Ranger* (May 20, 1983).

tive of the company contracting out the unit may have considerable informal authority. This arrangement has at times resulted in confused lines of responsibility, especially during emergencies. Poor coordination between the drilling unit and shore-based personnel and lack of a well-defined chain of command can slow response time, as was demonstrated in the Ocean Ranger incident. The Coast Guard has undertaken a review of licensing regulations in order to clarify rules for assignment of responsibility y.

In addition, safety problems and solutions often lie in the attitudes and actions of personnel, rather than equipment. Some offshore companies and drilling contractors give safety a high priority using the safety records of prospective contractors as an element in the bid selection process. Many companies hold safety meetings where workers can voice safety concerns.

Training is the foundation for safety. MMS requires that training be given to specialized personnel. Many offshore companies operate training schools or pay for employees to attend such schools. However, investigations of catastrophic offshore incidents have found that training of personnel, including those responsible for operating systems crucial to the safety of others, has been inadequate on some rigs. For example, no one on board the Ocean Ranger had more than a rudimentary understanding of the ballast control system, and there were no trained lifeboat crews.

Among other applicable regulations, the Coast Guard requires that emergency drills be held at least once each month on manned offshore facilities. For mobile drilling units, a boat drill is required at least once each week in which all personnel report to their stations and demonstrate their ability to perform their assigned duties, and weather permitting, at least one lifeboat is partially lowered and its engine started and operated. Each lifeboat is to be lowered to water, launched, and operated at least once every 3 months. There are, however, no requirements that Federal inspectors witness and evaluate the adequacy of evacuation drills on OCS facilities.

According to some observers, drills are not held according to this schedule or are ***pro forma*** exercises on some rigs, held only to meet minimum regulatory requirements. Similarly, personnel have reported that they have not been informed of their emergency assignments even though posting of such information is required. Periods of large turnover of personnel on rigs increase the difficulty of establishing a high degree of proficiency (e. g., through teamwork) in safety-related tasks. The Marine Board has recommended that Federal regulations include mechanisms that promote more active company attention to safety, such as pubic visibility and accountability, safety performance standards, and personnel standards.

## Regulation

Despite the great number and variety of regulatory requirements bearing on offshore safety, there are no specific requirements that employers submit safety plans that aim at an integrated assessment of the adequacy of safety measures, such as drills, evacuation plans, and lines of responsibility. There are existing requirements that bear on planning, but there is no separate rig-by-rig review that looks at all of the components of technology and management practices that are involved in offshore safety.

Regulations mandate scheduled inspections of all facilities at least once a year, supplemented by an unspecified number of periodic, unannounced inspections. These are performed by the Coast Guard and MMS. A drilling technician inspects rigs on an average of once a month after drilling begins. If a violation is found, sanctions range from a warning, with 1 week given to correct the deficiency, to shutdown of the piece of equipment, the well, or the entire operation. Also, an investigation is conducted following any accident, and notices are sent to all lessees and operators describing incidents, apparent causes, and actions taken by operators to prevent a recurrence. Civil and criminal penalties are provided for infractions of requirements.

However, the Ocean Ranger disaster pointed out important deficiencies in Coast Guard inspection procedures. After the initial inspection in December 1979, no subsequent formal inspections of the Ocean Ranger were carried out, aside from one brief visit from an official. Although its certification had expired in December 1981, no reinspection was made up to the time of the February 1982 sinking. Although the Coast Guard directed that the lifeboats and life rafts on the Ocean Ranger be replaced within 2 years, no replacements were made and no effort was made by the Coast Guard to ascertain whether its directive had been carried out. In addition, the rig was not manned according to requirements of its inspection and cargo ship safety equipment certificates.

In general, the Coast Guard relied on the classification given to the Ocean Ranger by the American Bureau of Shipping (ABS) as proof of design adequacy, and the Coast Guard did not independently assess such things as the capability of the ballast pumping system. ABS ratings focus on certification of structure, machinery, and equipment, and do not cover personnel competence, training, or safety management practices.[24]

The Coast Guard has had difficulty in carrying out the required number of inspections on fixed platforms due to funding limitations.[25] It is unclear how the Coast Guard will handle inspections should activities be significantly expanded in Arctic regions. Currently, Coast Guard inspection resources are concentrated in the Gulf of Mexico, and aside from several small LORAN stations, all Coast Guard installations in Alaska are located in southern portions of the State, many hundreds of miles away from frontier areas.

[24] Royal Commission on the Ocean Ranger Marine Disaster, *Report One: The Loss of the Semisubmersible Drill Rig Ocean Ranger and Its Crew* (Canada: Canadian Ministry of Supply and Services, 1984).

[25] Thomas Tutwiler, in *Proceedings of Safety of Life Offshore Symposium* (International Association of Drilling Contractors and Scripps Institute of Oceanography, June 1983), p. 54,

Inspection alternatives considered by the Coast Guard include relinquishing some scheduled inspections to MMS, the lessee, or to a third-party. However, the Coast Guard would continue unannounced inspections on a small percentage of facilities, and worker complaints could trigger other inspections. The main disadvantage of self-certification is the possibility that inspections would be less strict, thereby lowering safety. Third-party inspection analogous to current third-party verification of design and construction would be preferable in this regard, if such firms were held to strict standards. An issue to be resolved is who would bear the cost of third-party inspections. Industry currently pays for third-party verification.

Whether safety levels can indeed be maintained or increased within the Coast Guard's budgetary constraints is uncertain. The Coast Guard believes that savings resulting from delegating inspections will enable it to concentrate resources on the rigs with poor records. Improved data collection is essential to this goal, however.

OSHA does not conduct its own offshore inspections. OSHA's position is that if the Coast Guard exercised authority over workplace safety and health, OSHA authority is superseded. However, the Coast Guard does not have detailed workplace safety rules, and it is unclear which, if any, OSHA rules apply. The Coast Guard has a regulatory project to develop more detailed Coast Guard workplace safety standards. Review is also needed of respective OSHA and Coast Guard responsibilities.