

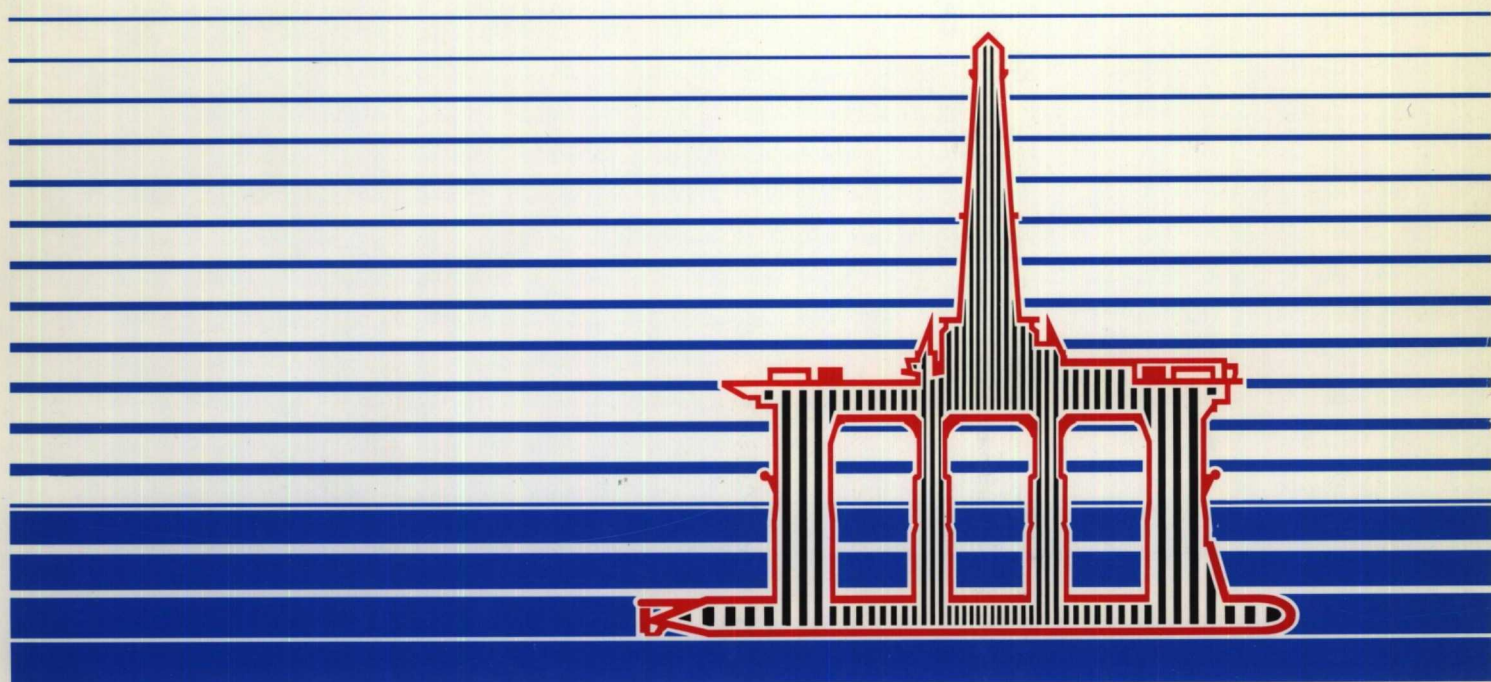
Royal Commission on the
Ocean Ranger Marine Disaster

Canada



Commission Royale sur le
Désastre Marin de l'*Ocean Ranger*

Newfoundland & Labrador



**Report One: The Loss of the Semisubmersible
Drill Rig *Ocean Ranger* and its Crew**

84/87
August 13, 1984

REPORT OF ROYAL COMMISSION ON "OCEAN RANGER"
RELEASED TO PUBLIC

OTTAWA – On behalf of the Government of Canada, the Honourable Gerald Regan, Minister of Energy, Mines and Resources, today made public the first report of the Royal Commission on the Ocean Ranger Marine Disaster. The report, presented to the governments of Canada and of Newfoundland and Labrador on August 8, 1984, is being released simultaneously in St. John's by the Newfoundland Government.

The Minister commended the Royal Commission for its painstaking study into the loss of the semisubmersible Ocean Ranger, particularly the thoroughness and sensitivity with which it handled the human side of the tragedy. He expressed concern that the release of the report would be painful for the families involved, but hoped that they would be comforted by the thought that the tragedy had been so thoroughly studied in the interests of greater marine safety in Canada's difficult and challenging offshore conditions.

The Government agrees with the thrust of the Royal Commission's 66 recommendations. The results of the study, together with the response of the various departments concerned will be shared with the international community, since they affect the question of marine safety worldwide.

Mr. Regan noted that of the 66 recommendations about one-third had already been implemented or were being put in place before receipt of the report. The remaining recommendations demand further study, either on an interdepartmental basis or in consultation with industry.

While the Department of Energy, Mines and Resources is coordinating the Government's overall response to the Commission's recommendations, departments will be answering individually for matters within their own mandates.

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84/87
Le 13 août 1984

LE RAPPORT DE LA COMMISSION ROYALE D'ENQUÊTE
SUR LE NAUFRAGE DE L'OCEAN RANGER EST RENDU PUBLIC

OTTAWA – Le ministre de l'Énergie, des Mines et des Ressources, M. Gerald Regan, a rendu public aujourd'hui, au nom du gouvernement du Canada, le premier rapport de la Commission royale d'enquête sur le naufrage de la plate-forme de forage Ocean Ranger. Ce rapport, qui a été remis aux gouvernements du Canada et de Terre-Neuve et du Labrador le 8 août courant, a aussi été rendu public aujourd'hui par le gouvernement provincial, à St-Jean.

M. Regan a fait l'éloge de la Commission royale pour son étude approfondie des circonstances qui ont mené au naufrage de la plate-forme semi-submersible Ocean Ranger. Il a particulièrement insisté sur la minutie et la délicatesse dont a fait preuve la Commission en abordant l'aspect humain de cette tragédie. M. Regan a dit reconnaître que la publication du rapport pourrait évoquer des souvenirs pénibles pour les familles des victimes, mais il a exprimé l'espoir que celles-ci puissent trouver un certain réconfort dans le fait que cette enquête approfondie sur la tragédie visait à améliorer la sécurité maritime dans l'offshore canadien, où les conditions difficiles posent un défi constant.

Le gouvernement du Canada est d'accord avec l'essentiel des 66 recommandations mises de l'avant par la Commission royale. Les résultats de l'enquête et la réponse des divers ministères visés seront diffusés à la collectivité internationale puisqu'ils ont une incidence sur la sécurité maritime à l'échelle mondiale.

M. Regan a souligné qu'environ un tiers des 66 recommandations avaient été mises en œuvre ou étaient en voie de l'être avant que le rapport soit remis au gouvernement. Le reste des recommandations exigent une étude plus approfondie, soit entre ministères ou en consultation avec l'industrie.

Le ministère de l'Énergie, des Mines et des Ressources agit comme coordonnateur pour faire connaître la position globale du gouvernement face aux recommandations de la Commission royale d'enquête, mais les divers ministères feront chacun connaître leurs positions respectives sur les questions relevant de leur secteur de compétence.

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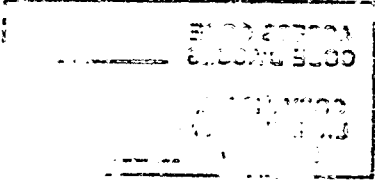
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The Royal Commission on the *Ocean Ranger*
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Canada and Newfoundland

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Drill Rig *Ocean Ranger* and its Crew**



Royal Commission on the
Ocean Ranger Marine Disaster

Canada



Commission Royale sur le
Désastre Marin de l'*Ocean Ranger*

Newfoundland/Terre-Neuve

To Her Excellency
The Governor General

May It Please Your Excellency

We, the Commissioners appointed to inquire into and report upon the reasons and causes for the loss of all members of the crew of the semisubmersible self-propelled drill rig *Ocean Ranger* and of the *Ocean Ranger* on the 15th day of February, 1982 on the Continental Shelf off Newfoundland and Labrador and to inquire into, report upon and make recommendations with respect to safety offshore Eastern Canada, beg to submit to Your Excellency the following first report, which is the final report on the loss.

Chief Justice
The Honourable T.A. Hickman
Chairman

The Honourable G.A. Winter, O.C.
Vice-Chairman

Fintan J. Aylward, Q.C.

Jan Furst, P.Eng.

M.O. Morgan, C.C.

N. Bruce Pardy, P.Eng.

August, 1984
St. John's, Newfoundland

Commissioners/Commissaires

Chief Justice T. Alexander Hickman, Chairman/Président
The Honourable Gordon A. Winter, O.C., Vice Chairman/Vice-Président
Fintan J. Aylward, Q.C.
Jan Furst, P. Eng.
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Ocean Ranger Marine Disaster

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Newfoundland/Terre-Neuve

To His Honour
The Lieutenant Governor

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ACKNOWLEDGEMENTS

This report is a distillation of a large volume of technical data and testimony. It has been a mammoth task to organize, analyse, reduce and present this material. The Royal Commission has been fortunate in its dedicated staff who have ably undertaken this work and who have devoted long hours to it over an extended period. We thank them individually and collectively for what they have done and continue to do.

We also wish to express our appreciation to our Chief Technical Advisor, Dr. Ewan Corlett and his assistants, who were present throughout the diving operation on the Grand Banks and involved with each phase of the model testing program and the analysis of the technical evidence. Thanks are also due to the master and crew of the diving support vessel *Balder Baffin* and to the diving team from Hydrospace Marine Services Limited without whose courage and competence neither this Royal Commission, nor the other agencies who were given access to the vital evidence recovered during the dive, could have identified the causes of this major disaster.

We also acknowledge the contribution of the scientists and technical staff at the National Research Council in Ottawa and the Norwegian Hydrodynamic Laboratories in Trondheim who undertook and brought to a successful conclusion an innovative model testing program. We have been assisted throughout this process by Dr. Derek Muggeridge of Memorial University of Newfoundland who maintained technical liaison with all the participants in that program. The Aviation Safety Engineering Division of Transport Canada undertook the technical analysis of the electrical equipment and portholes recovered from the ballast control room of the *Ocean Ranger*. This work, carried out under the direction of Mr. Max Vermij, has provided an important part of the basis for our findings. In conclusion, we express our appreciation for the wise counsel of Dr. Omond Solandt, C.C., Senior Advisor to the Royal Commission, who has helped us in all aspects of our inquiry.

For all those others who have helped us over the past two years but are not mentioned by name, we express our appreciation and warm thanks.

The Honourable T. Alexander Hickman, Chief Justice
Commission Chairman

PREFACE

Early on the morning of February 15, 1982, the semisubmersible drilling unit *Ocean Ranger* capsized and sank on the Grand Banks, 170 nautical miles east of St. John's, Newfoundland, Canada. The entire 84-man crew was lost in this disaster. Of the 69 Canadian crew members, 56 were residents of Newfoundland and the shock wave created by the loss was felt particularly throughout that province. In that tightly-knit maritime community there were few who did not discover a link, direct or indirect, to one of those lost in the tragedy. The inquiry by this Royal Commission is therefore of unusually deep concern to Newfoundlanders. It also has important implications for the rest of Canada and for other maritime nations engaged in the search for off-shore oil and gas.

It is normal practice under the *Canada Shipping Act* for the Marine Casualty Investigation Branch of Transport Canada to conduct a preliminary investigation into any loss that falls within the meaning of a shipping casualty under the *Act*. Thereafter, if a formal investigation is to be held, a Court consisting of one or more Judges is appointed under the provisions of the *Canada Shipping Act* to investigate the loss. The *Act* provides that the Court be assisted by two or more assessors. This procedure was followed in the case of the *Ocean Ranger* but, because of the breadth of the inquiry, Chief Justice the Honourable T. Alexander Hickman of the Supreme Court of Newfoundland, Trial Division, was appointed not only a Commissioner under the *Canada Shipping Act* but also a Royal Commission of one under Part One of the *Inquiries Act*. The Government of Newfoundland also appointed a Royal Commission to investigate the loss. Subsequent public concern was expressed that the existence of two official investigations would create problems and a duplication of effort. Both levels of government responded swiftly by agreeing to combine the inquiries and adopt identical terms of reference through the joint appointment of a Royal Commission under the Chairmanship of Chief Justice Hickman. The Chairman of the Provincial Royal Commission, the Honourable Gordon A. Winter, O.C., was appointed Vice-Chairman.

In jointly establishing this Royal Commission, the two governments gave it a unique and challenging mandate divided into two parts: the first requiring a formal (quasi-judicial) inquiry into the loss of the *Ocean Ranger* and its crew; the second calling for a process of research and opinion-gathering directed towards providing recommendations to both governments on how to improve the safety of drilling operations on the continental shelf off Eastern Canada.

What makes the *Ocean Ranger* inquiry different is the breadth of Part One of the mandate which directs the Royal Commission to examine not only the cause of the loss, but also areas of vulnerability within which lay the potential for this disaster

and the seeds for future ones. This latter aspect is the basis for the transition from the specific concerns of Part One to the more general inquiry called for in Part Two. In considering this mandate, the Commissioners decided that their major task was to address future safety offshore and that the investigation of the loss of the *Ocean Ranger* and its crew should go beyond the realm of acceptable conjecture or reasonable deduction based upon circumstantial evidence. It should endeavour through scientific investigation to determine why in fact the *Ocean Ranger*, alone of the three rigs on Hibernia, capsized and sank during a severe winter storm.

One of the first actions of the Royal Commission was to issue a formal order forbidding any approach to or disturbance of the wreck of the *Ocean Ranger*. Shortly thereafter, it awarded a contract for an underwater examination of the rig to obtain technical data and to find, and, if possible, to recover evidence which would explain the cause of the loss. The portholes, ballast control panel, and related electrical equipment recovered during the dive were subjected to extensive analysis and testing. A number of major technical investigations were also initiated, the most far-reaching of which was a comprehensive program of model tests. These tests were carried out jointly by the National Research Council of Canada in Ottawa and the Norwegian Hydrodynamic Laboratories in Trondheim. The extensive use of model testing as an investigative tool to examine the behaviour of a mobile offshore drilling unit was unprecedented. All the reports on the technical investigations undertaken have been formally introduced as evidence at the public hearings.

While the technical program progressed, the organization and planning of the Part One public hearings proceeded in parallel. Practice and Procedure Rules for the Inquiry were drawn up and published. A Notice was published in July, 1982, in Canada and the United States, inviting Applications for Standing. Nine interested parties were subsequently granted standing with the right to be represented and to cross-examine witnesses at the public hearings, and three organizations were given official observer status. The hearings commenced on October 25, 1982. The number of sitting days totalled 89 with the hearings extending over 17 months and finishing on March 22, 1984. During this time, 102 witnesses appeared and 321 exhibits were entered in evidence resulting in 14,281 pages of verbatim transcript (Appendix A).

It was apparent from the outset that a great deal of complex information, much of it highly technical, would be processed at the hearings. An audio and video



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system was installed to avoid the delays which could have resulted if all participants had not been able to hear and see the evidence as it was presented. A computerized index of the entire transcript of the evidence given at the hearings was maintained in order to facilitate searches for specific references, as well as to provide confirmation that all references to any given aspect of the evidence had been identified. This data base also contains references to regulations, reports, periodical articles and a variety of other relevant material.

The *Ocean Ranger* was registered in the United States and, as required under U.S. law, a Marine Board of Investigation was established to investigate the loss. The United States Coast Guard and the National Transportation Safety Board, an independent United States Federal Agency, participated jointly in this investigation. The Commissioners realized that the process of scientific inquiry involved under their mandate would not lend itself to the production of an early interim report with credible findings. For this reason they decided that they should not be concerned whether other agencies issued their reports first, but that they would rather cooperate fully with them and share whatever information they acquired. Accordingly, the Royal Commission placed at the disposal of these agencies the results of its diving and technical investigations. Both the National Transportation Safety Board and the United States Coast Guard have since published reports of their findings which were accepted as evidence by the Royal Commission. In like manner, information needed by the Governments of Canada and Newfoundland in their inquiries and in their formulation of new guidelines, regulations or policies was provided as it became available. This policy was adopted to ensure that the process of investigation did not inhibit the necessary process of improving safety offshore.

Canadians from all parts of the country are now employed in exploratory drilling operations off Eastern Canada. Responsibility for their safety and for the proper conduct of this major new industry in Canadian coastal waters has been assumed by government both nationally and provincially. The international maritime and oil industries have a keen interest in how these responsibilities are administered. Much has been achieved by governments and the industry over the past two years. But a great deal still remains to be done.

INTRODUCTION

The primary purpose of this report is to set forth the results of the inquiry of the Royal Commission into the loss of the *Ocean Ranger* and its crew. This inquiry has addressed three basic questions:

Why did the *Ocean Ranger* capsize and sink?

Why was none of the crew saved?

How can other similar disasters be avoided?

This report will provide an answer to the first two questions and an initial response to the third. A broad investigation has been launched into this third area to identify practical means of improving human safety during drilling operations off the east coast of Canada. The results will be presented in a second and final report.

When it was launched in 1976, the *Ocean Ranger* was the largest, self-propelled semisubmersible offshore drilling unit in the world. Designed by ODECO Engineers Incorporated for ODECO International of New Orleans, Louisiana, and the Norwegian firm of Fearnley & Eger A/S, it was built at the Hiroshima yard of Mitsubishi Heavy Industries. The rig's maiden voyage in June of that year led from Japan to Alaska. After completing wells in the Bering Sea, the Gulf of Alaska and the Lower Cook Inlet, it left the area in September 1977 and remained idle, moored at various locations on the west coast of North America until August 1979. The rig was then moved east via Cape Horn to drill a well in the Baltimore Canyon off New Jersey, thence to Ireland in May 1980 for another two wells, and finally back across the Atlantic to arrive on the Grand Banks of Newfoundland on November 6, 1980 (Appendix D, Item 1). The *Ocean Ranger* began drilling in the Hibernia Field on contract between Mobil Oil Canada Limited (Mobil), the operator for the Hibernia Consortium, and ODECO Drilling of Canada Limited (ODECO). This contract, signed in February 1980, was initially for 13 months, but after its expiry a two-year agreement was negotiated and accepted by both parties. Under this contract, ODECO was responsible for the rig and the crew and Mobil was responsible for the well.

The *Ocean Ranger* was built and classed in accordance with the 1973 rules of the American Bureau of Shipping. The rig was originally registered in Panama, but in 1980 ODECO, then the sole owner, transferred it to United States registry. When it began to drill off the east coast of Canada, it was subject to United States regulations and, consequently, to the regulations of the International Maritime Organization to which the United States subscribed. The drilling operation itself was governed by the conditions of the permits issued to Mobil by the Government of Canada and the Government of Newfoundland and by the offshore drilling regulations of each government.

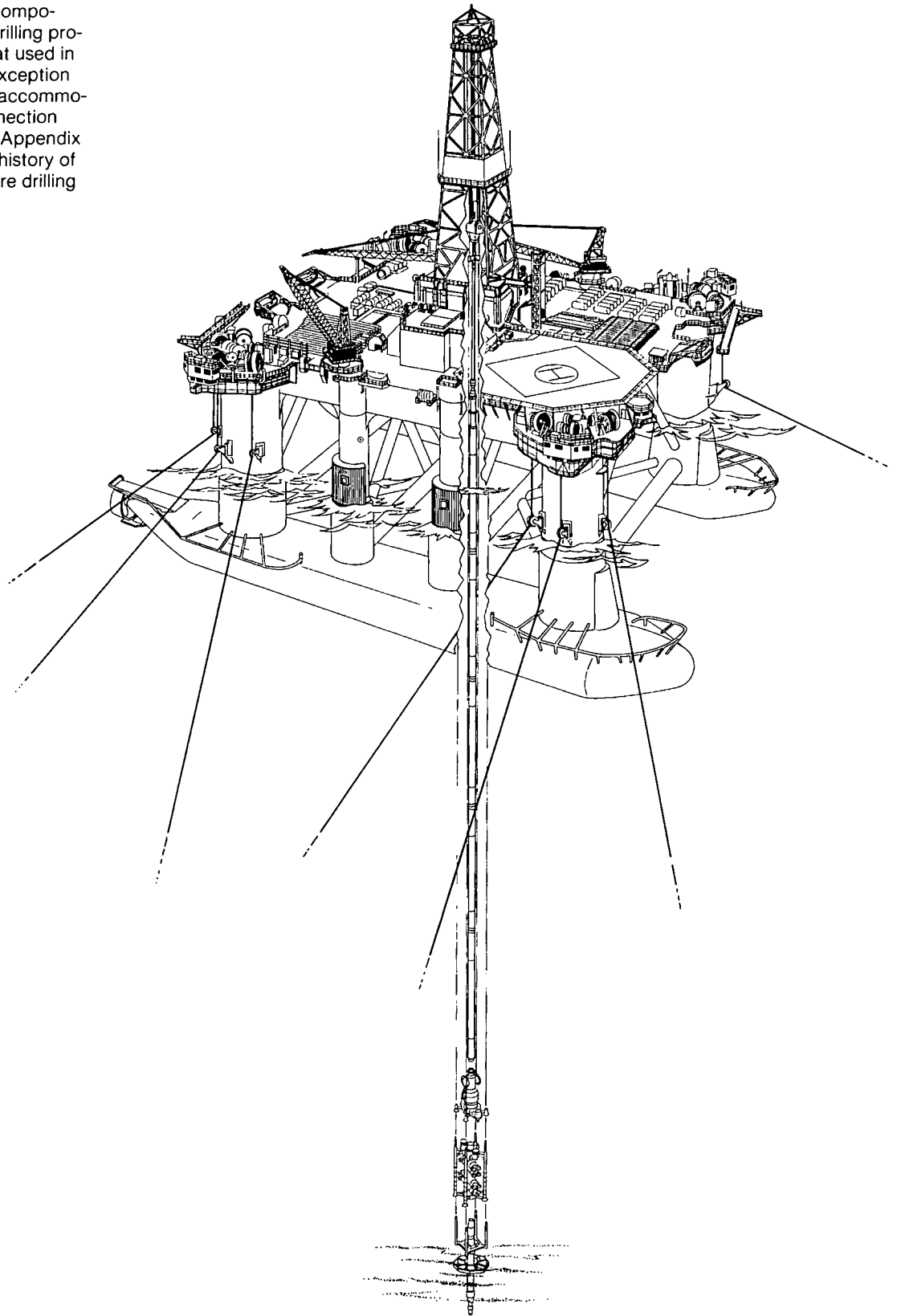
Despite its size, its reputation for invulnerability, and the regulatory control exerted over its design, construction, and operation, the *Ocean Ranger* and its entire crew were lost less than two years after the rig arrived on the Grand Banks. The enormity of this disaster was widely felt, following as it did the loss of 123 lives a year earlier when the *Alexander Kielland* capsized in the North Sea. In 1983 the *Glomar Java Sea* and all 81 of its crew were lost in a storm in the China Sea. These tragedies have focused concern on and raised questions about the reliability of the technology involved in offshore drilling operations under adverse environmental conditions and the adequacy of the regulatory agencies whose function is, at least in part, to ensure that these operations are carried out safely. The reliability of that technology and the adequacy of the regulatory structures need to be viewed in the context of the historical evolution of offshore oil exploration.

The complex technology that is currently in use by the petroleum industry to find and develop hydrocarbon resources has evolved over the past one hundred years. By the 1930's, drilling equipment and techniques used for exploration and production on land were successfully adapted to sites covered by water. Initially these were in swampland and in shallow sheltered waters inland or inshore. Pile-supported drilling platforms were succeeded by barge-supported platforms which could be floated to the site, flooded and thereby fixed in place. A further step in the evolution of offshore technology led to the development of the jack-up rig. This type of rig, the most widely used in offshore exploration today, rests on legs on the seabed and is jacked up until the drilling platform is raised above the level of the waves. Exploration rigs supported on the sea bottom are presently limited to depths of about 350 feet and cannot be used where, for instance, they may have to be moved quickly to avoid icebergs and heavy pack ice. Two developments overcame these limitations; one was the drillship, originally a conventionally designed vessel adapted for drilling, and the other was the semisubmersible, a free-floating platform supported by pontoons and columns.

This gradual evolution of offshore technology has accelerated rapidly during the last two decades. The growth in demand for petroleum, the drive to achieve national self-sufficiency in energy, the depletion of known land-based reserves and the vagaries of OPEC policies have led to a surge of exploration, on a worldwide scale, into deeper water offshore under increasingly harsh environmental conditions. The exploration sector of the oil industry has a strong tradition of tackling difficult engineering problems and solving them successfully. It has accordingly brought this approach and the practical experience on which it was based, to the evolution of offshore drilling techniques. The objective has remained unchanged: to provide a stable platform from which to drill. It is not surprising, therefore, that the pursuit of this central purpose has been by the extrapolation of existing land-based oilfield technology and the extension of tested methods.

Despite this predominantly industrial focus the activity takes place at sea. The unique nature of this industrial-marine endeavour, together with the constant evolution of new technology, has presented a challenge to agencies established to set standards and govern the design and activities of more traditional craft. These agencies have tended to evolve their standards and their role, as did the rig designers, on the basis of experience. Despite the newness and the diversity of the industry, one trend has become clear for both the participants and the regulators: offshore drilling has emerged as an industrial activity that takes place in a marine environment rather than as a marine activity undertaken for industrial purposes. Unless the coastal state decides otherwise senior industrial personnel on rigs of United States registry are in charge of the rig regardless of their knowledge of ships or the sea. The key element in the operation is the drilling. The mariners' contribution to this activity is to get the platform to the well site and to maintain it in position as stable as possible so that

This illustration shows the major components of the *Ocean Ranger*. The drilling process is essentially the same as that used in land-based operations, with the exception of the systems which are used to accommodate the rig's motion and the connection between the rig and the seabed. (Appendix B gives a brief explanation of the history of and techniques used in the offshore drilling industry.)



drilling may proceed safely and efficiently. When the rig is in transit, an experienced marine crew must be in charge and the industrial crew may not even be on board. While the rig is moored and drilling operations are underway, the marine crew, to the extent that one exists, has little to do.

It is against this dual industrial-marine focus and in light of the emerging regulatory system and evolving technology that the loss of the *Ocean Ranger* needs to be examined. In addition to inquiring into and reporting upon the reasons and causes for the loss of the rig and its crew, the Royal Commission is also required to report on a number of specific matters that are relevant to the accident. These include: the regulatory framework and how it functioned; certain aspects of the design of the *Ocean Ranger* and of its critical systems; the composition of the crew and how the rig was manned; the command structure; and operations on the Grand Banks leading up to the disaster. The first four chapters of the report cover these areas and provide background information, analyses and comments. Most of the discussion centres on those factors deemed most instrumental in contributing, although often indirectly, to the loss of the *Ocean Ranger* and its crew.

Only after this framework of secondary considerations has been established does the report deal with the accident itself and its immediate causes and results. In the fifth chapter the sequence of events leading up to the abandonment of the *Ocean Ranger* by its crew is reconstructed. This is followed in the sixth and seventh chapters by a presentation of the key technical evidence, and an analysis of the most probable cause of the loss of the rig. A reconstruction of the sequence of events following the decision by the crew to abandon the rig, the response to the emergency and its final outcome are described and analyzed in the eighth and ninth chapters. The final chapter contains the conclusions and recommendations.

Appendices, contained at the back of this report, will be referred to frequently and will be of assistance to readers who require supplementary information. Since this report incorporates numerous marine, oil industry, aviation, and other technical terms, an extensive glossary has also been included for reference. Certain words used in a particular context are footnoted and explained where they occur within the body of the report. The units of measurement reflect those recorded in the testimony and in common use within the marine, industrial and aviation sectors in 1982. Where necessary, metric units have been appended. To avoid confusion, no attempt has been made to convert to metric those units recorded in the testimony, or the units in which the *Ocean Ranger* was originally designed.

REGULATORY STRUCTURE

CHAPTER ONE REGULATORY STRUCTURE

From the time that it was initially designed to the time that it capsized and sank on the Hibernia Field off Eastern Canada, the *Ocean Ranger* was governed by the rules and regulations of numerous national and international bodies. Its design, construction and operation were the subject of complex sets of compulsory laws and voluntary rules established by the rig's classification society, its Flag State or country of registry, the Coastal State or country of operation and international conventions.

In reviewing the roles played by these regulatory bodies an attempt has been made to identify the scope of responsibility of each agency, to determine whether prescribed procedures were carried out by these agencies, and finally to evaluate the adequacy and appropriateness of these procedures in the case of the *Ocean Ranger*. Specific regulatory deficiencies such as those related to training, manning and life-saving equipment will be treated in the relevant chapters of the report.

CLASSIFICATION SOCIETIES

The classification of vessels originated in England over 200 years ago in Lloyd's Coffee House, where the most influential members of the shipping trade in London would gather to discuss business. Underwriters who were called upon to accept maritime risks and shippers of valuable cargo sought some guarantee of fitness of the vessel for the voyage in prospect. There evolved a rough system of inspecting hulls and equipment and a Ships' List to provide a description of the ships likely to be offered for insurance. In 1760 a committee was established and in 1765 the first Register of Shipping was produced. This committee set the standards for the construction and maintenance of ships and equipment and, on the basis of experience, developed rules which applied recognized standards. From this voluntary association evolved Lloyd's Register of Shipping which is now an international, non-profit body engaged primarily in the classification of ships and the maintenance of technical standards of shipbuilding. Its activities are controlled by a general committee consisting of ship-owners, underwriters, shipbuilders, engine builders and steel makers drawn from many countries. Similar organizations have developed in other maritime nations; the Bureau Veritas in France, Det norske Veritas in Norway and the American Bureau of Shipping (ABS) in the United States.

The standards set by the different classification societies are similar and represent the cumulative experience acquired through extensive research and development work by the societies and other groups and through surveys of thousands of ships over many years. In general the societies are intended to certify that:

1. the vessel complies with a standard of construction which assures adequate structural strength under the conditions for which it was designed;

2. the vessel's electrical and mechanical systems comply with acceptable standards and are installed properly;
3. the vessel is maintained by its owner to the extent that it does not lose its classification;
4. all major repairs or structural changes to the vessel are carried out in accordance with the rules of the society.

The rules of the classification society do not apply to the seaworthiness¹ of the vessel nor to the lifesaving and navigational equipment since these are governed by international conventions and the regulations of the vessel's Flag State.

Classification societies became involved in the offshore drilling industry in the 1930s and 1940s when they applied their rules for building and classing steel vessels to barges, drilling tenders, and support vessels. In the early years of the industry, when drilling units had many of the features of conventional vessels and operated close to shore, this approach was satisfactory. But by the 1950s new designs were being created for drilling rigs which allowed them to operate farther from shore and in increasingly severe environmental conditions. As these designs evolved, they diverged increasingly from the conventional shape of ships, and it became apparent that specific rules would have to be developed for the mobile offshore drilling unit (MODU).

ABS published the first set of MODU rules in 1968 and revised them in 1973 and again in 1980. In the 1970s, Lloyd's Register, Det norske Veritas, and Bureau Veritas also developed standards for MODUs. In instances where the MODU rules did not address a particular aspect of a rig's design, the rules for ships were applied. The *Ocean Ranger* was constructed and classed in accordance with ABS's 1973 *Rules for Building and Classing MODUs* and retained its classification to the time of its loss. In August 1973 ODECO Engineers Inc. requested ABS to review the *Ocean Ranger's* pre-construction plans. Later Mitsubishi Heavy Industries, the Japanese shipyard that had been commissioned to build the rig, produced more detailed plans which were approved by ABS and one of their surveyors was assigned to the work site to monitor the rig's construction. Since the rig was to operate under the Panamanian Flag, ABS was further commissioned by the Government of Panama to ensure that the rig complied with the *Safety of Life at Sea (SOLAS) Convention* and the *International Load Line Convention*. After successfully completing its sea trials and receiving ABS approval of its *Booklet of Operating Conditions* (operating manual), the *Ocean Ranger* was granted an interim classification for Unrestricted Ocean Operations Worldwide on May 28, 1976.

Section 1.17 Responsibility . . . "It is understood and agreed by all those who avail themselves in any way of the services of the Bureau that neither the Bureau nor any of its Committees and employees will, under any circumstances whatever, be responsible or liable in any aspect for any act or omission whether negligent or otherwise. . . ."

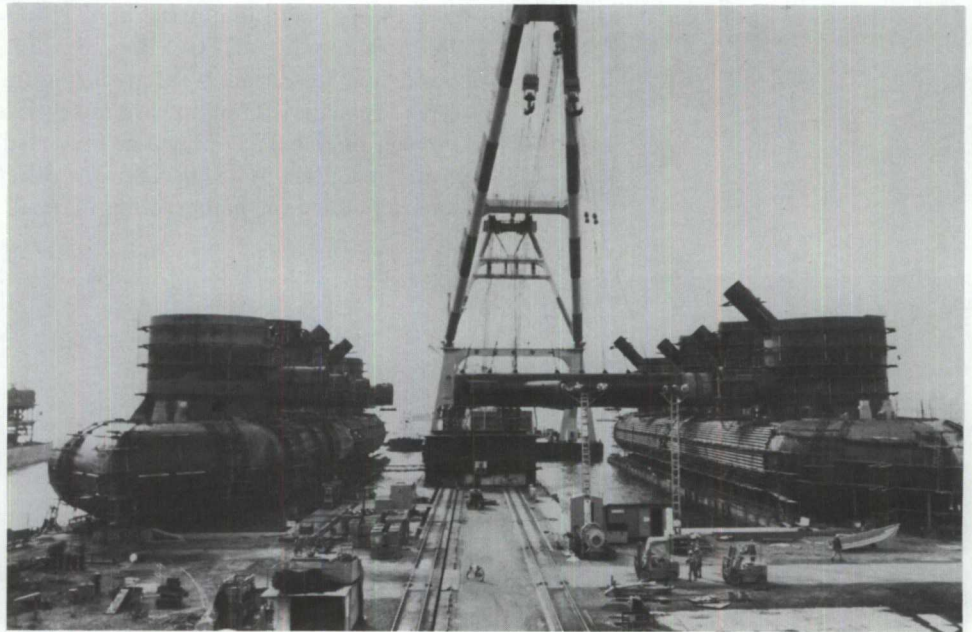
*1973 Rules for Classing and Building Offshore Mobile Drilling Units
American Bureau of Shipping*

There appears to have been a misconception about the role of ABS and the meaning of its classification of the *Ocean Ranger*. Classification of a drilling unit by a society simply means that the unit has been constructed in accordance with the rules of that society. It does not guarantee seaworthiness. It implies that the society, on the basis of its cumulative experience, believes that a unit so constructed will be structurally sound and sufficiently equipped for the sea conditions for which it has been classed. As a spokesman for ABS pointed out at the hearings, if others choose to give a wider meaning to classification, they do so at their peril for the limited role of the classification society is quite clearly set out in its rules.

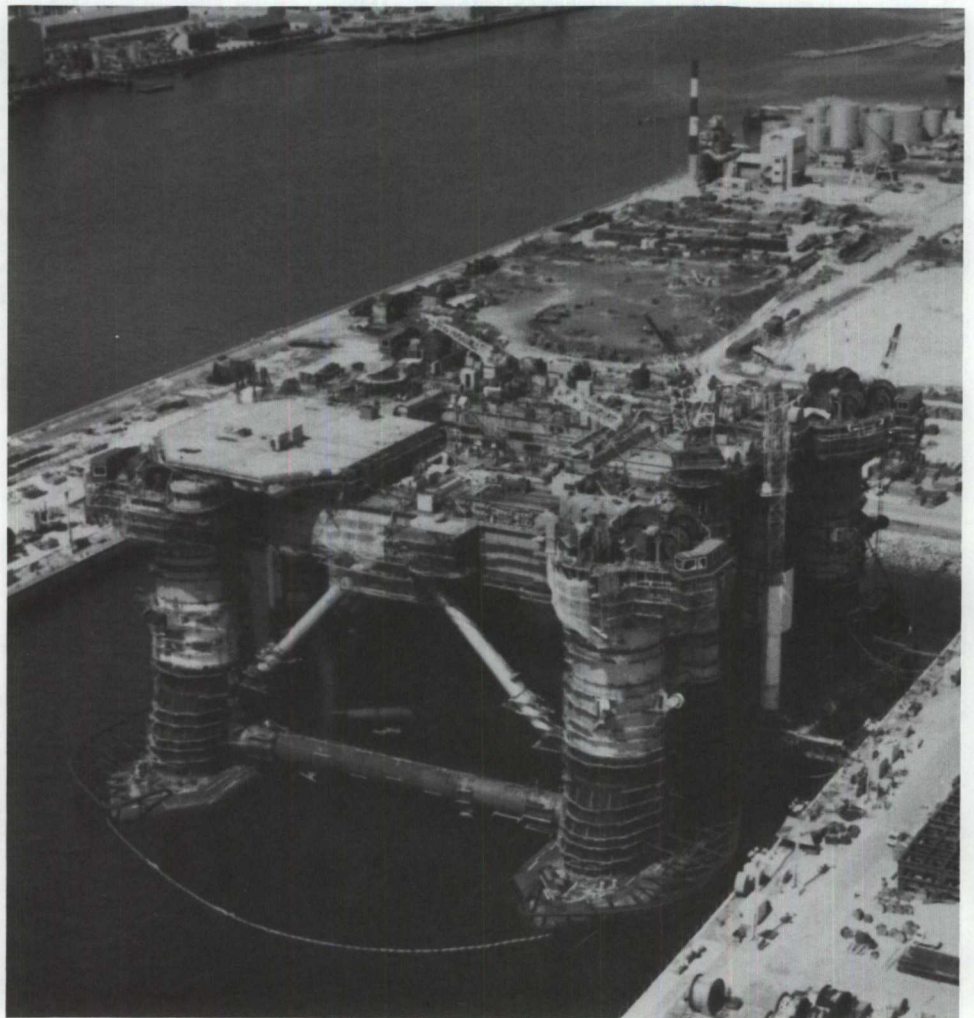
At the time that the *Ocean Ranger* was constructed, the applicable ABS rules required that as a condition of classification each drilling unit was to have prepared to the satisfaction of the Bureau an operating manual to provide suitable guidance

¹According to counsel for ABS, the Bureau avoided the word "seaworthy" because of its connotation in U.S. law. "In U.S. law a vessel is seaworthy if it is reasonably adequate for the service in which it is engaged" (Public Hearings, Volume 86, p. 14,060).

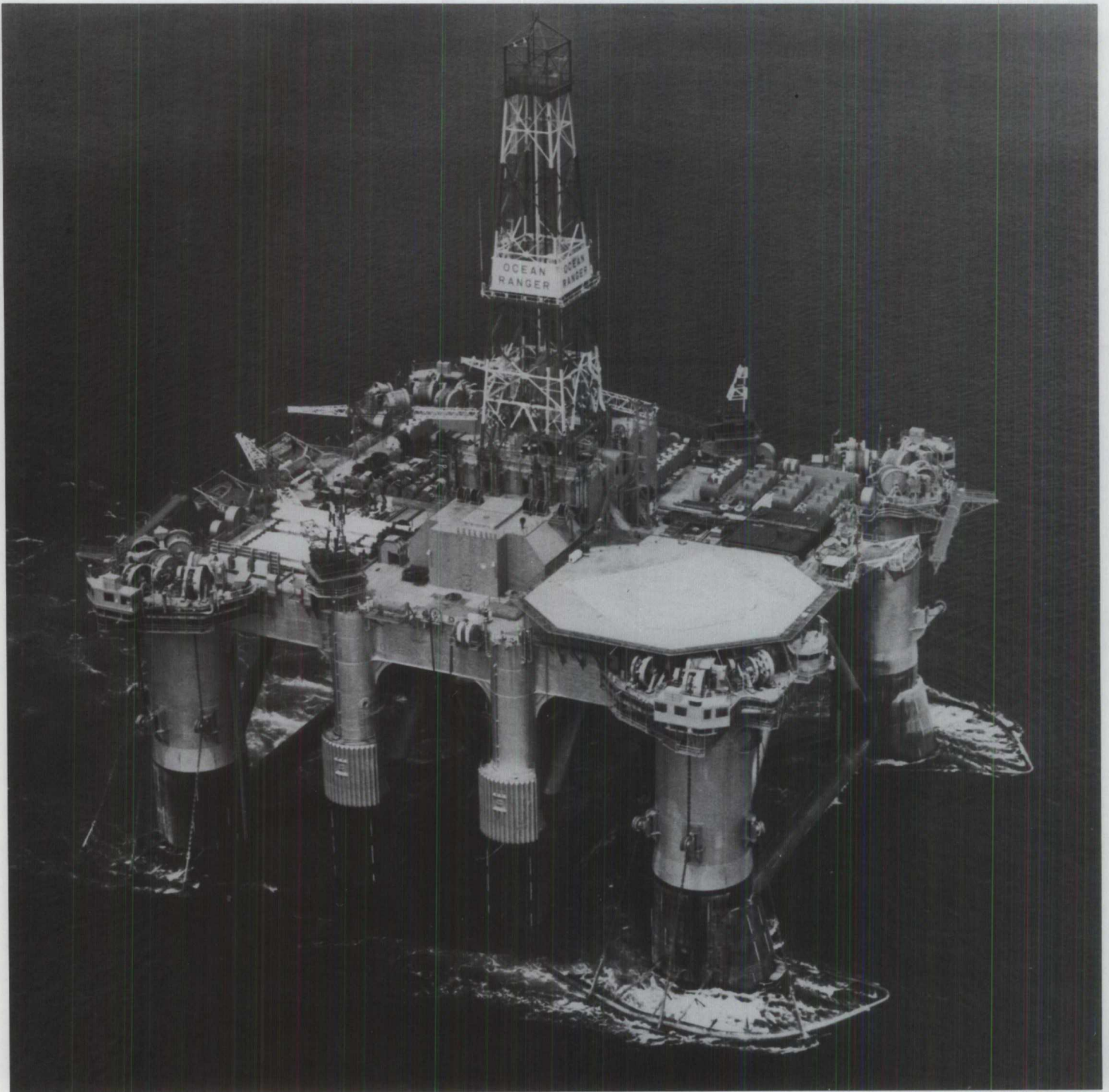
1.1 The *Ocean Ranger's* pontoons under construction at the No. 2 Eba shipyard of Mitsubishi Heavy Industries, Hiroshima, Japan. The floating crane in the background is lifting the first section of the four transverse braces into place.



1.2 With the upper hull in place, the major structural components of the *Ocean Ranger* have been completed. One of the rig's three cranes has already been installed to aid in the movement of materials during construction. The helideck above the accommodations area at the starboard bow is almost finished. The anchor bolsters, designed to protect the pontoons during mooring operations and to store the twelve main anchors, are visible near the waterline at the corner columns.



for the safe operation of the unit. A manual for that purpose was prepared for the *Ocean Ranger* by ODECO Engineers Inc. It described how to keep the rig level and stable, how to operate it safely during transit, mooring, drilling and storms, and how to take remedial action in case of severe damage. On January 21, 1977, this manual received final ABS approval as indicated by the official seal of the Bureau stamped on its first page. ABS disclaims any responsibility for the adequacy of the instructions contained in the operating manual, but its official stamp could lead third par-



ties to conclude that this approval applied to the manual as a whole and that the instructions for the safe operation of the unit contained therein were deemed by ABS to be complete and adequate. This may explain why the Flag and Coastal States did not carry out a stringent critical review of the *Ocean Ranger's* operating procedures. The manual, however, was deficient in several respects. Of particular concern was the lack of direction for the prevention of downflooding into the chain lockers, for the closure of deadlights in the ballast control room during storm conditions, and for the manual control of the ballast system in the event of serious damage to the ballast control console. There was also no information concerning the limitations of the ballast system.

This same observation applies to the design of the rig and the interrelationship of some of its systems. One might assume, since the rig had been classed by ABS, that its ballast system could correct adverse trims or lists in a timely and proper manner. In fact this was not the case. The rules of ABS did not deal with such matters as the angle of inclination from which the rig could recover by pumping out ballast water. Nor did its rules deal with the adequacy or appropriateness of the rig's mooring system other than to test it in accordance with the specifications of the owner. Furthermore ABS had no standards relating to the thickness of portlights or to the protection of chain lockers from flooding. These are but examples of areas affecting the safety of the rig not covered by ABS rules. They illustrate that in classing a drilling unit the society certifies only that the unit has been constructed in accordance with its rules. Matters related to the safe design and operation of the rig which are not covered by these rules are the concern of other regulatory authorities which can establish and enforce their own standards.

INTERNATIONAL CONVENTIONS

The international maritime community has developed minimum safety requirements for all vessels operating in international waters. The International Maritime Organization² (IMO), whose membership includes most of the world's maritime nations, is the body responsible for formulating standards on marine safety, pollution, and navigation. IMO members adopt these as minimum requirements and supplement them with their own regulations. Canada, for example, supplements the IMO requirements with the *Canada Shipping Act*³. IMO did not have standards governing MODUs when the *Ocean Ranger* was built (the first MODU code was adopted in 1980) and the two Conventions which did apply, the *Safety of Life at Sea (SOLAS)* (1960) and the *Load Line Convention* (1966) were designed for conventional vessel categories.

The *SOLAS Convention* deals with the design of a vessel as it affects the safety of life. It covers structure and machinery, communication equipment, and lifesaving appliances. The *Load Line Convention* is concerned with a vessel's freeboard under normal operating conditions and stipulates the maximum depth to which it can be loaded. The Flag State is responsible for issuing certificates verifying that a vessel meets IMO standards. These certificates are normally valid for two years. The *Ocean Ranger* was inspected for compliance with these Conventions on two occasions. In 1976 ABS inspected the rig on behalf of Panama, the *Ocean Ranger's* Flag State at the time, and in 1979, when the rig was changed to United States registry, it was inspected by the U.S. Coast Guard. At the time of its loss the *Cargo Ship Safety Equipment Certificate*, which was one of the certificates issued by the U.S. Coast Guard under the *SOLAS Convention* (1960), had expired. The rig did, however, have a valid Certificate under the *Load Line Convention* (1966).

1.3 The *Ocean Ranger* under tow in Hiroshima Bay prior to its maiden voyage from Japan to Alaska. The rig was designed to withstand 115-mile per hour winds and 110-foot seas, and at this time was the largest semisubmersible drilling unit in the world.

²The Inter-Governmental Maritime Consultative Organization was formed in 1958 as a specialized agency for the United Nations; it changed its name to the International Maritime Organization (IMO) in 1982.

³The *Act* at the time of the loss regulated vessels registered in Canada and vessels operating within twelve miles of the shore; it therefore did not apply to the *Ocean Ranger*.

FLAG STATE

Under its new country of registry, the *Ocean Ranger* became subject to the regulations of the U.S. Coast Guard contained in the MODU section of the *Code of Federal Regulations*. First issued in January 1979, the U.S. Coast Guard regulations covered the structure, stability, operation and safety of the rig, with specific references to manning requirements and command. The inspection by the U.S. Coast Guard took place in December of 1979, and was conducted by personnel from the Marine Inspection Office in Rhode Island. The *Ocean Ranger* was the first semisubmersible inspected by that office. There is no evidence to indicate that the technical aspects of the rig's design and the capability of its ballast pumping system were assessed. It appears that the ABS classification was accepted as proof of the design's adequacy. No major deficiencies were discovered, but ODECO was directed to replace the lifeboats and life rafts with approved equipment within two years. Following approval of the *Booklet of Operating Conditions*, a *Certificate of Inspection* detailing crew requirements was granted for a period of two years.

The U.S. Coast Guard did not carry out any regular inspections subsequent to the initial one to confirm that the vessel was being operated properly and that its regulations were being followed, although one official visited briefly and prepared a list of suggested items for maintenance and changes. It is United States policy that the owner is responsible for contacting a U.S. Coast Guard office before the expiry of the certificate in order to arrange for reinspection. Up to the time of the loss ODECO had failed to contact the U.S. Coast Guard, even though the initial certificate had expired in December 1981. The lifeboats and life rafts on the *Ocean Ranger* did not meet U.S. Coast Guard requirements. It has also been determined that the rig was not manned according to requirements of the *Certificate of Inspection*, and that its *Cargo Ship Safety Equipment Certificate*, issued under the *SOLAS Convention*, had expired. The U.S. Coast Guard relied on ABS's classification for the adequacy of the design of the rig. It did not adopt inspection procedures to ensure compliance with its *Certificate of Inspection* and its requirements for lifesaving equipment. (Appendix C contains certificates and other related information.)

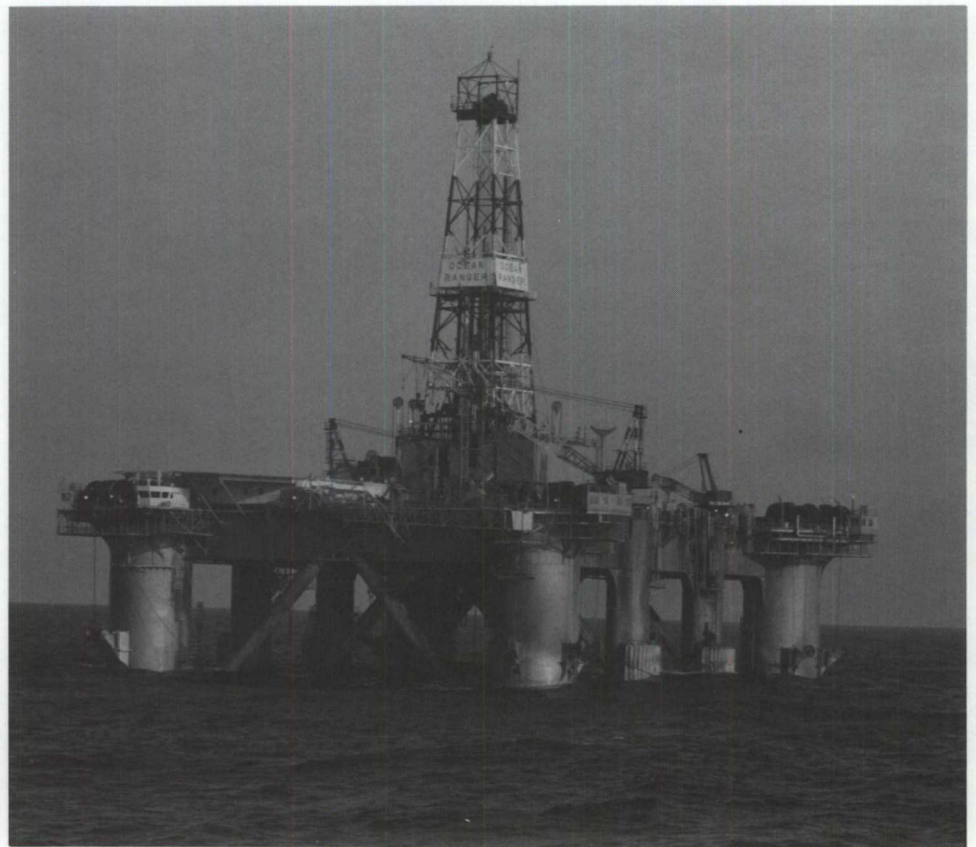
COASTAL STATE

When the *Ocean Ranger* was engaged to drill on the Grand Banks, it came under the additional regulatory control of two governments, the Government of Canada and the Government of Newfoundland. Because of an unresolved jurisdictional dispute over the ownership of offshore resources, each government enforced its own requirements on Grand Banks drilling operations. The Canadian Government, through the Resource Management Branch of the Department of Energy, Mines and Resources (subsequently renamed the Canada Oil and Gas Lands Administration [COGLA]), required that offshore operators adhere to the *Canada Oil and Gas Drilling Regulations (1980)*. At the same time, the operators were required to follow *Newfoundland and Labrador Petroleum Regulations (1977)* which were primarily administered by the Newfoundland and Labrador Petroleum Directorate (The Petroleum Directorate). Although the two sets of regulations differed in content, both were designed to ensure that drilling was carried out with an adequate degree of human and environmental safety. COGLA used an application-permit system to regulate all aspects of offshore drilling. They required an operator to submit for approval information on the proposed drilling program including details on the drilling unit, support craft and emergency procedures (contingency plans). In March 1980, Mobil Oil Canada Ltd., the operator for the consortium on the Hibernia Field, notified COGLA of their intention to use the *Ocean Ranger*. COGLA inspected the rig, and, although the radar system and the ventilation system were noted as being unacceptable, no major structural or safety deficiencies were found. On November 3, 1980, COGLA

approved Mobil's application to drill a well using the *Ocean Ranger*. From that time until its loss, COGLA inspectors visited the *Ocean Ranger* on 19 occasions, directing their attention primarily to the safety of the drilling operation. Although the inspectors sometimes examined the lifesaving appliances, no attempt was made to determine their suitability for evacuation.

The Petroleum Directorate played a lesser role in regulating the Grand Banks operations. Although the Petroleum Directorate used an application and permit process similar to COGLA's, it relied upon others to ensure that the rig was structurally sound, seaworthy and properly fitted with lifesaving equipment. When the *Ocean Ranger* arrived on the Grand Banks, the Petroleum Directorate employed one inspector who assessed daily drilling reports for compliance with the Province's regulations. In the event of a serious breach of the operator's drilling permit, the inspector would visit the rig to conduct an on-site inspection. Although none were carried out on the *Ocean Ranger*, a number of informal visits were made by representatives from several provincial agencies including the Petroleum Directorate. The Province of Newfoundland also enforced regulations covering local preference for the purchase of goods and services associated with the drilling program, and maintained requirements for the employment of local labour on the rig.

The requirements of the classification society and the Flag State do not reduce the Coastal State's responsibility to ensure that foreign flag MODUs operating within its jurisdiction are seaworthy and that adequate marine standards and practices are applied and maintained. Representatives of both COGLA and the Petroleum Directorate admitted in evidence that they did not treat the safety of the rig's marine operations as a priority. Since the sinking of the *Ocean Ranger*, the U.S. Coast Guard, COGLA and the Petroleum Directorate have all increased the rigour of both regulations and enforcement policies.



1.4 The *Ocean Ranger*, on the Hibernia J-34 well off Eastern Canada during December 1981, is shown at the 80-foot drilling draft. Some of the twelve anchor cables are visible running from the fairleads on the corner columns.