

THE ROYAL COMMISSION

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THE ROYAL COMMISSION

APPENDIX A

APPENDIX A

THE ROYAL COMMISSION

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Item A-1

**Terms of Reference
Canada**

**The Order of the Governor-in-Council No. PC 1982-819
dated the 17th day of March A.D. 1982**

Certified to be a true copy of a Minute of a Meeting of the Committee of the Privy Council, approved by His Excellency the Governor General on the 17 March, 1982.

WHEREAS the Committee of the Privy Council has had before it a report of the Prime Minister submitting that it is essential that an Inquiry be made into the matters hereinafter set forth in paragraphs 1 to 3 below.

Therefore the Committee of the Privy Council on the recommendation of the Prime Minister advise that the Honourable T. Alexander Hickman, Chief Justice of the Trial Division of the Supreme Court of Newfoundland, the Honourable Gordon A. Winter, Moses Morgan, Esq., Fintan J. Aylward, Queens Counsel, Bruce Pardy, Esq. and Jan Furst, Esq., all of the Province of Newfoundland, be hereby appointed Commissioners under Part I of the Inquiries Act to:

1. Inquire into and report upon the loss of all members of the crew of the semi-submersible self-propelled drill rig *Ocean Ranger*, and of the *Ocean Ranger*, on or about the 15th day of February, 1982 on the Continental Shelf off Newfoundland and Labrador, the reasons and causes therefor and, without restricting the generality of the foregoing, to inquire into, report upon and make recommendations in respect of the following matters:
 - (a) the design, construction and stability of the *Ocean Ranger* and its suitability to conduct marine and drilling operations on the Continental Shelf off Newfoundland and Labrador;
 - (b) inspection, inspection procedures, licensing, classification and certification pertaining to the conduct of marine drilling operations by the *Ocean Ranger* on the Continental Shelf off Newfoundland and Labrador;
 - (c) all aspects of safety of life at sea, including the sufficiency of life saving equipment on board the *Ocean Ranger* and whether such life saving equipment was used or could have been used;
 - (d) all aspects of occupational health and safety which related to the officers and crew of the *Ocean Ranger*;
 - (e) the certification, training and safety of the officers and the crew and their respective responsibilities including those of the Master and the Toolpusher on board the *Ocean Ranger*;
 - (f) the search and rescue response and any other emergency response thereto, both from within Newfoundland and elsewhere;
 - (g) oil pollution prevention procedures and whether the drill hole was left in a safe condition prior to or at the time of the casualty;
 - (h) any acts or omissions of the owner, the charterer, the operator or any contractor in respect thereto; and

**Terms of Reference
Province of Newfoundland**

**The Lieutenant Governor-in-Council's Commission
dated the 16th day of March A.D. 1982**

ELIZABETH THE SECOND by the Grace of God
of the United Kingdom, Canada and Her Other
Realms and Territories QUEEN, Head of the
Commonwealth, Defender of the Faith.

W. Anthony Paddon
Lieutenant-Governor

COMMISSION

TO: The Honourable T. Alexander Hickman,
Chief Justice of The Trial Division
of the Supreme Court of Newfoundland
(Chairman),
The Honourable Gordon A. Winter, O.C., LL.D.,
Moses O. Morgan, C.C.,
Fintan J. Aylward, Q.C.,
Jan Furst, Esq., and
Bruce Pardy, Esq.

WHEREAS it appears desirable and expedient that an enquiry be made into the loss of life resulting from the sinking of the *Ocean Ranger* on February 15th., 1982.

NOW KNOW YE that under and by virtue of The Public Enquiries Act Chapter 314 of The Revised Statutes of Newfoundland, 1970, We, by and with the advise of Our Executive Council of Our Province of Newfoundland, reposing great trust and confidence in your knowledge, integrity and ability, have constituted and appointed and do by these presents constitute and appoint you the said T. Alexander Hickman, Gordon A. Winter, Moses O. Morgan, Fintan J. Aylward, Jan Furst, and Bruce Pardy to be Commissioners to hold an enquiry into the matters following, that is to say:

1. Enquire into and report upon the loss of all members of the crew of the semi-submersible self-propelled drill rig *Ocean Ranger*, and of the *Ocean Ranger*, on or about the 15th. day of February, 1982, on the Continental Shelf off Newfoundland and Labrador, the reasons and causes therefor and, without restricting the generality of the foregoing, to enquire into, report upon and make recommendations in respect of the following matters:
 - (a) the design, construction and stability of the *Ocean Ranger* and its suitability to conduct marine and drilling operations on the Continental Shelf off Newfoundland and Labrador;
 - (b) inspection, inspection procedures, licensing, classification and certification pertaining to the conduct of marine drilling operations by the *Ocean Ranger* on the Continental Shelf off Newfoundland and Labrador;
 - (c) all aspects of safety of life at sea, including the sufficiency of life saving equipment on board the *Ocean Ranger* and whether such life saving equipment was used or could have been used;

- (i) any other related matter.
2. Inquire into, report upon and make recommendations with respect to:
- (a) both the marine and drilling aspects of practices and procedures in respect of offshore drilling operations on the Continental Shelf off Newfoundland and Labrador and without restricting the generality of the foregoing, the matters referred to in paragraphs 1.(a) to 1.(e) as they related to other drilling units conducting marine and drilling operations on the Continental Shelf off Newfoundland and Labrador; and
 - (b) to the extent necessary and relevant, such practices and procedures in other Eastern Canada offshore drilling operations.

The Committee further advise that:

- (a) the establishment of this Commission and the appointment of the Commissioners hereunder is without prejudice to both the claim of the Government of Canada and the claim of the Government of Newfoundland to legislative jurisdiction and proprietary rights on or in respect of the Territorial Sea or the Continental Shelf off Newfoundland and Labrador; and
- (b) notwithstanding the terms of reference set forth in this Order in Council, the Commissioners be directed not to consider, comment upon nor make recommendations in respect of the claims to jurisdiction and rights aforesaid.

The Committee further advise that:

- (a) the Honourable T. Alexander Hickman be the Chairman of the Commission and that the Honourable Gordon A. Winter be Vice-Chairman of the Commission;
- (b) the Chairman and the Vice-Chairman be authorized, after consultation with the other Commissions, to:
 - (i) adopt such practices and procedures for all purposes of the Inquiry as may from time to time be necessary for the proper conduct of the Inquiry and, after consultation with the other Commissioners, vary those practices and procedures from time to time;
 - (ii) engage the services of counsel to aid and assist the Commissions in the Inquiry at such rates of remuneration and reimbursement as may be approved by the Treasury Board;
 - (iii) rent such space for offices and hearing rooms in consultation with the Department of Public Works and according to the practices of the Department;
 - (iv) engage the services of such accountants, engineers, technical advisors or other experts, clerks, reporters and assistants as they may deem necessary or advisable, at such rates of remuneration and reimbursement as may be approved by the Treasury Board; and
 - (v) exercise all powers conferred upon them by subsection (2) to subsection (4) of section 11 of the Inquiries Act;

- (d) all aspects of occupational health and safety which related to the officers and crew of the *Ocean Ranger*;
- (e) the certification, training and safety of the officers and the crew and their respective responsibilities including those of the Master and the Toolpusher on board the *Ocean Ranger*;
- (f) the search and rescue response and any other emergency response thereto, both from within Newfoundland and elsewhere;
- (g) oil pollution prevention procedures and whether the drill hole was left in a safe condition prior to or at the time of the casualty;
- (h) any acts or omissions of the owner, the charterer, the operator or any contractor in respect thereto; and
- (i) any other related matter.

2. Enquire into, report upon and make recommendations with respect to:

- (a) both the marine and drilling aspects of practices and procedures in respect of offshore drilling operations on the Continental Shelf off Newfoundland and Labrador and, without restricting the generality of the foregoing, the matters referred to in paragraphs 1.(a) to 1.(e) as they relate to other drilling units conducting marine and drilling operations on the Continental Shelf off Newfoundland and Labrador; and
- (b) to the extent necessary and relevant, such practices and procedures in other Eastern Canada offshore drilling operations.

AND WE DO advise that the establishment of this Commission and your appointment as Commissioners hereunder is without prejudice to both the claim of the Government of Canada and the claim of the Government of Newfoundland to legislative jurisdiction and proprietary rights on or in respect of the Territorial Sea or the Continental Shelf off Newfoundland and Labrador;

AND FURTHER, notwithstanding the terms of reference as set forth in this your Commission, We hereby direct you not to consider, comment upon nor make recommendations in respect of the claims to jurisdiction and rights aforesaid;

AND FURTHER, We do authorize

- (i) the Honourable T. Alexander Hickman to be the Chairman of the Enquiry and the Honourable Gordon A. Winter to be Vice-Chairman of the said Enquiry;
- (ii) the Chairman and Vice-Chairman, after consultation with the other Commissioners, to:
 - (A) adopt such practices and procedures for all purposes of the enquiry as may from time to time be necessary for the proper conduct of the enquiry and, may, after consultation with the other Commissioners, vary those practices and procedures from time to time;
 - (B) engage the services of counsel to aid and assist the Commissioners in the enquiry at such rates of

3. The Commissions be authorized to sit at such times and in such places, and to view such locations, both in and outside Canada, as the Chairman may, after consultation with the other Commissioners, from time to time decide; and

4. The Commissions be authorized to submit interim reports to the Governor in Council from time to time.

The Committee further advise that the Commissioners be directed to submit a final report to the Governor in Council with all reasonable dispatch and file with the Dominion Archivist the papers and records of the Commission as soon as reasonably may be after the conclusion of the Inquiry.

And the Committee further advise that pursuant to section 37 of the Judges Act, the Honourable T. Alexander Hickman be authorized to act as a Commissioner and Chairman for the purpose of the said Inquiry.

CERTIFIED TO BE A TRUE COPY

CLERK OF THE PRIVY COUNCIL

- remuneration and reimbursement as may be approved by the Lieutenant-Governor in Council;
- (C) rent such space for offices and hearing rooms as they deem necessary and advisable at such rates as may be approved by the Lieutenant-Governor in Council;
 - (D) engage the services of such accountants, engineers, technical advisors or other experts, clerks, reporters and assistants as they may deem necessary or advisable, at such rates of remuneration and reimbursement as may be approved by the Lieutenant-Governor in Council;
 - (E) exercise all powers conferred upon them by Section 5 of The Public Enquiries Act;
- (iii) you, the said Commissioners, to sit at such time and in such places, and to view such locations, both in and outside Canada, as the Chairman may, after consultation with the other Commissioners, from time to time decide;
 - (iv) you, the said Commissioners, to submit interim reports to the Lieutenant-Governor in Council from time to time.

AND WE DO, by these Presents, confer upon you, the said Commissioners, the power of summoning before you any witness or witnesses and of requiring all such witnesses to give evidence orally or in writing upon oath or upon solemn affirmation, and to produce such documents and things as you, the said Commissioners, may deem requisite to the full investigation of the matters you are appointed to enquire into.

AND FURTHER, We require you, with as little delay as possible to report to Us your findings upon the matters herein submitted for your consideration together with the papers and records of the Commission.

AND FURTHER, We do authorize the Honourable T. Alexander Hickman to act as a Commissioner and Chairman for the purpose of the said Enquiry, pursuant to Section 37 of The Judges Act.

IN TESTIMONY WHEREOF, We have caused these Our Letters to be made Patent and the Great Seal of Newfoundland to be hereunto affixed.

WITNESS: Our trusty and well-beloved the Honourable W. Anthony Paddon, Member of Our Order of Canada, Lieutenant-Governor in and for Our Province of Newfoundland.

AT OUR GOVERNMENT HOUSE in Our City of St. John's this *16th* day of *March* in the year of Our Lord one thousand nine hundred and eighty-two and in the thirty-first year of Our Reign.

BY COMMAND, Deputy REGISTRAR GENERAL

Item A-2
Formal Order of Commission

IN THE MATTER OF THE INQUIRY
INTO THE LOSS OF THE *OCEAN*
RANGER ON OR ABOUT THE 15TH
DAY OF FEBRUARY, 1982, ON THE
CONTINENTAL SHELF OFF
NEWFOUNDLAND AND LABRADOR

WHEREAS the Governor-in-Council has been pleased pursuant to Section 2 of **The Inquiries Act** to cause an Inquiry to be made into the loss of all members of the crew of the semi-submersible self-propelled rig *Ocean Ranger* and of the *Ocean Ranger* on or about the 15th day of February, 1982, on the Continental Shelf off Newfoundland and Labrador.

NOW, therefore, pursuant *IT IS HEREBY ORDERED AND DECLARED* that:

1. No person shall remove, touch or otherwise disturb in any manner or cause or permit to be removed, touched or disturbed the said *Ocean Ranger* or any of its gear or equipment at Latitude 46 degrees 43 minutes 34 seconds North, Longitude 48 degrees 50 minutes 11 seconds West.
2. No person or vessel shall approach or cause or permit an approach to be made closer than 500 meters from the location of the said *Ocean Ranger* at Latitude 46 degrees 43 minutes 34 seconds North, Longitude 48 degrees 50 minutes 11 seconds West for any purpose except upon such terms and conditions as may be prescribed by the Commissioners.

Dated at St. John's in the Province of Newfoundland this 22nd day of March A.D., 1982.

BY ORDER OF THE COMMISSIONERS



CHAIRMAN

TO:

ODECO Drilling of Canada Limited
Topsail Road
St. John's, Newfoundland

Mobil Oil Canada Limited
Atlantic Place
St. John's, Newfoundland

Item A-3 Practice and Procedure Rules

SHORT TITLE

1. These Rules may be cited as the *Ocean Ranger* Marine Disaster Inquiry Rules.

APPLICATION

2. These Rules apply to that portion of the inquiry of the Royal Commission on the *Ocean Ranger* Marine Disaster contained in the paragraph 1 of Order-in-Council PC 1982-819 and paragraph 1 of the Lieutenant Governor-in-Council's Commission dated the 16th day of March A.D. 1982.

INTERPRETATION

3. In these Rules:

"Act" means the **Inquiries Act**, R.S.C. 1970, c.1-13.

"Chairman" means the person appointed by the Governor-in-Council and the Lieutenant Governor-in-Council to be Chairman of the Commission.

"Commission Counsel" means Counsel appointed by the Commissioners and the Lieutenant Governor-in-Council to assist them in their inquiry.

"Commissioner" means a person appointed by the Governor-in-Council and the Lieutenant Governor-in-Council to conduct the inquiry.

"Commission" means the Royal Commission on the *Ocean Ranger* Marine Disaster established pursuant to Order-in-Council PC 1982-819 and the Lieutenant Governor-in-Council's Commission dated the 16th day of March A.D. 1982.

"Governor-in-Council" means the Governor-in-Council of Canada.

"Inquiry" means that portion of the inquiry of the Commission contained in paragraph 1 of Order-in-Council PC 1982-819 and paragraph 1 of the Lieutenant Governor-in-Council's Commission dated the 16th day of March A.D. 1982.

"Order-in-Council" means the Order of the Governor-in-Council No. PC 1982-819 dated the 17th day of March A.D. 1982.

"Lieutenant Governor-in-Council" means the Lieutenant Governor-in-Council for the province of Newfoundland.

"Technical Investigating Officer" means a

person authorized and deputed to inquire into any matter within the scope of the Commission under the provisions of subsection (2) of section 11 of the Act.

NOTICE OF INQUIRY

4. (1) Notice of the inquiry shall be served upon the Owner, the Charterer and the Operator of the *Ocean Ranger* and upon any other person, corporation, Minister of the Crown or Crown Agency who, in the Commission's opinion, may have an interest in the inquiry.

(2) In addition to, or in lieu of the Notice of Inquiry provided for in subsection (1) of this section 4, Notice of the Inquiry may be given by publication of the same in the *Canada Gazette*, the *Gazettes* of each of the Provinces of Canada and in such Canadian and foreign newspapers or other publications as in the opinion of the Commission would be appropriate.

(3) A Notice of Inquiry shall set out the time and place appointed for the Inquiry and shall have attached thereto a copy of Order-in-Council PC 1982-819 and the Lieutenant Governor-in-Council's Commission dated the 16th day of March A.D. 1982.

RIGHT TO BE HEARD

5. (1) The following persons or their counsel shall have the right to be heard and to examine witnesses heard at public hearings of the Commission:

(a) Commission Counsel;

(b) Any person against whom a charge is made in the course of the Commission's investigation into the conduct of any person;

(c) Any person, in addition to the above persons, who in the Commission's opinion ought to be given such right and then upon such terms as the Chairman may direct.

(2) Any person wishing to be heard shall apply in writing to the Commission for the right to be heard and to examine witnesses heard at public hearings of the Commission, and shall state specifically his interest or interests and the extent of standing desired. Provided that the Commission is satisfied that standing is necessary for the protection of such interest or

interests, the Chairman may grant standing upon such terms as the Chairman may direct.

(3) At the conclusion of the public hearings of the Commission any person, group or association will have the right at that time to make submissions to the Commission in writing, and, if the Chairman deems it necessary or expedient so to do, to make oral submissions following the filing of such written submissions.

(4) The Commission may in its discretion hold hearings in camera and the Chairman shall decide in the circumstances of that particular case who shall be permitted to attend, which counsel shall be permitted to attend and what conditions may be imposed upon any persons or counsel permitted to attend, all in the light of the law governing the inquiry.

(5) Persons having the right to be heard may apply to Commission Counsel to call any witness or witnesses and such witness may be called by Commission Counsel. Any such application shall contain the full name and address of the witness and a concise statement of why such a witness should be called to give evidence. Any witness so called shall be examined first by Commission Counsel and then, subject to the provisions of subsection (5) of section 7 of these Rules, by other persons having the right to be heard and to examine witnesses at public hearings of the Commission in the order designated by the Chairman.

COMMISSION COUNSEL

6. (1) Commission Counsel shall assist the Commission in the orderly conduct of the Inquiry and ensure that all relevant evidence is submitted to the Commission.

(2) At any public hearing any member of the public may request Commission Counsel, in writing, to ask a particular question of a witness and Commission Counsel may, in his discretion, ask such question.

(3) Commission Counsel shall prepare for the Commission's consideration in camera any charges which may be made against any person and upon being directed so to do by the Com-

mission give reasonable notice of the same to the person of the charge of misconduct alleged against him and to proceed thereafter in such manner as the Chairman directs and in accordance with the provisions of Section 12 and 13 of the Act.

INQUIRY PROCEDURE

7. (1) Prior to the commencement of public hearings for the purpose of hearing witnesses the Commission may hold procedural hearings for the purpose of determining what persons shall have the right to be heard and for the purpose of having Commission Counsel tender documentary or physical evidence which Commission Counsel determines should be tendered in advance of the public hearings for the convenience of the Commission or persons entitled to be heard.

(2) The Notice of Inquiry shall be read at the first public hearing of the Inquiry.

(3) Commission Counsel shall proceed first with the examination of witnesses on behalf of the Commission.

(4) Commission Counsel may examine, cross-examine or re-examine all witnesses.

(5) Other persons having the right to be heard and to examine witnesses at public hearings of the Commission may, in such order as the Chairman directs and subject to such terms as may have been imposed upon such right by the Chairman under the provisions of subsections 1(c) or 2 of section 5 of these Rules, examine, cross-examine or re-examine witnesses called by Commission Counsel.

PRESENCE OF INTERESTED PERSONS

8. At the time and place appointed for holding the Inquiry the Commission may proceed with the Inquiry whether or not persons entitled to be heard or their counsel are present.

ATTENDANCE OF WITNESSES

9. Where the Commission requires the attendance of any witness, either of its own motion or as a result of any application, the Notice to be served on the witness shall be in the form set out in Schedule 1.

PRODUCTION OF DOCUMENTS

10. (1) Where the Commission requires the production of any document by any person either of its motion or as a result of an application, notice to be served on that person shall be in the form set out in Schedule 2.

(2) Other persons having the right to be heard may apply to Commission Counsel to require the production of any document and Commission Counsel may require the production of such document. Any such application shall contain a complete description of the document requested, the name and address of the person from whom production of the document should be requested and a concise statement of why such document should be produced.

(3) Where an Order under subsection (1) of this section 10 is not complied with, the Commission may, in addition to any remedy, admit such other evidence as is available, whether hearsay or not, as evidence of the documents and things specified in the Order.

SERVICE OF DOCUMENTS

11. Any notice, summons or other document issued under these Rules may be served personally at the address of the person to be served, by certified post, or by such other method of service as the Chairman may direct.

EVIDENCE

12. (1) The Commission may admit as evidence Affidavits, Statutory Declarations, Rogatory Commissions and other evidence made or taken under the laws of Canada or any other country that may be applicable in any case in which the Commission considers it fit and proper to have such evidence presented, and whether such evidence is sworn or unsworn.

(2) Questions asked and documents and exhibits tendered as evidence in the course of the examination of witnesses called on behalf of the Commission shall not be open to objection merely on the ground that they do or may raise questions or issues that are not contained in or vary from the Terms of Reference contained in paragraph 1 of respectively, Order-in-Coun-

cil PC 1982-819 and the Lieutenant Governor-in-Council's Commission dated March 16, 1982.

(3) Where documentary evidence or a witness is outside the jurisdiction of Canada or is otherwise not available for Commission hearings the Chairman or such person or persons as he may designate may be authorized to obtain such evidence in such manner as the Chairman may direct.

(4) Where possible the evidence of witness shall be taken under oath or solemn affirmation and witnesses shall be sworn or affirmed in the manner provided by the high courts having jurisdiction over the place where the evidence is taken.

(5) All evidence taken in any manner provided for by these Rules shall form a part of the record of the proceedings of the Commission.

13. (1) When the examination of all witnesses called by Commission Counsel has been concluded, other persons having the right to be heard and examine witnesses at public hearings of the Commission may adduce evidence relevant to their client's interests and such other evidence relevant to the subject matter of the Inquiry as the Chairman may by leave permit.

(2) Where any person's conduct is involved and that person is a person referred to in Section 12 or 13 of the Act, Commission Counsel shall:

(a) when the examination of all witnesses called on behalf of the Commission has been concluded, and,

(b) prior to any report made by the Commission against such person, inform the Commission of the issue upon which such person is entitled to be represented and heard.

SUBMISSIONS BY COUNSEL

14. (1) When all evidence has been adduced for the Inquiry, Commission Counsel and other persons entitled to be heard shall have the right to address the Commission viva voce in such order as the Chairman directs and Commission Counsel shall have the right to address the Commission last.

(2) The Chairman may direct that writ-

ten submission be made by counsel and other persons entitled to be heard in lieu of or in addition to their oral submissions.

THE CHAIRMAN

15. (1) The Chairman shall rule on any objections raised, determine all matters of procedure not provided for by these rules and, when in his discretion it is necessary or desirable for the purpose of fully discharging the duties of the Commission, may allow departures from these rules.

(2) The Chairman shall determine the admissibility of any evidence tendered at such time as he deems fit.

(3) The Chairman or any person designated by him may, in such a manner as the Chairman directs, take evidence in camera and in the absence of Commission Counsel or persons having the right to be heard and to examine witnesses at public hearings.

(4) The Chairman or any Commissioner or person designated by the Chairman to take evidence may take such evidence within or without Canada.

(5) Where by these Rules reference is made to a decision of the Commission, such decision of the Commission shall be enunciated by the Chairman.

QUORUM

16. A quorum for public hearings of the Commission shall be not less than four Commissioners.

ADJOURNMENTS

17. The Commission may adjourn its inquiry from time to time and from place to place.

AMENDMENTS

18. These rules may be amended from time to time by the Commission as it sees fit.

SCHEDULE I

**(Subpoena ad testificandum)
Pursuant to Section 4 of The Inquiries Act**

IN THE MATTER OF an Inquiry into the Loss of all Members of the Crew of the Semi-

submersible self-propelled drill rig *Ocean Ranger* and of the *Ocean Ranger* on or about the 15th day of February, 1982, on the continental shelf off Newfoundland and Labrador.

ELIZABETH, THE SECOND, by the Grace of God of the United Kingdom, Canada, and Her other Realms and Territories, QUEEN, Head of the Commonwealth, Defender of the Faith.

TO: 1. _____
2. _____
3. _____
4. _____

GREETING:

We command you that all excuses ceasing, you and each of you do personally be and appear before the Commissioners appointed under The Inquiries Act to inquire into the above loss at the place of the Inquiry at _____ in the City of St. John's in the Province of Newfoundland on the _____ day of _____ A.D., 1982, at _____ o'clock in the _____ noon to testify the truth according to your knowledge in an Inquiry being held by the Commissioners in the matter of the loss of the *Ocean Ranger* and its crew and hereof fail not at your peril.

Given under my hand at the City of St. John's in the Province of Newfoundland the _____ day of _____ A.D., 1982.

T. Alexander Hickman, Chief Justice,
CHAIRMAN OF THE COMMISSION

SCHEDULE II

**(Subpoena duces tecum)
Pursuant to Section 4 of The Inquiries Act**

IN THE MATTER OF an Inquiry into the Loss of all Members of the Crew of the Semi-submersible self-propelled drill rig *Ocean Ranger* and of the *Ocean Ranger* on or about the 15th day of February, 1982, on the continental shelf off Newfoundland and Labrador.

ELIZABETH, THE SECOND, by the Grace of God of the United Kingdom, Canada, and Her other Realms and Territories, QUEEN, Head of the Commonwealth, Defender of the Faith.

TO: 1. _____
2. _____
3. _____
4. _____

GREETING:

We command you that all excuses ceasing, you and each of you do personally be and appear before the Commissioners appointed under The Inquiries Act to inquire into the above loss at the place of the Inquiry at _____ in the City of St. John's in the Province of Newfoundland on the _____ day of _____ A.D., 1982, at _____ o'clock in the _____ noon to testify the truth according to your knowledge in an Inquiry being held by the Commissioners in the matter of the loss of the *Ocean Ranger* and its crew and that you bring with you and then and there produce before the said Commissioners the following documents, viz:

and show all and singular those things which you know, or which the said paper writing doth import of, in or concerning the present inquiry now depending on our said Commissioners and hereof fail not at your peril

Given under my hand at the City of St. John's in the Province of Newfoundland the _____ day of _____ A.D., 1982.

T. Alexander Hickman, Chief Justice,
CHAIRMAN OF THE COMMISSION

COMMISSIONERS

Chief Justice T. Alexander Hickman, Chairman
The Honourable Gordon 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.

COUNSEL

Leonard A. Martin, Q.C.
David B. Orsborn

COMMISSION SECRETARY

David M. Grenville

Item A-4

Royal Commission on the
Ocean Ranger Marine Disaster

Canada



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

Newfoundland/Terre-Neuve

APPLICATIONS FOR STANDING

Persons wishing to apply for standing to be heard by the Royal Commission on the Ocean Ranger Marine Disaster are requested to contact the Commission on or before August 20, 1982, for information on practice and procedure and on the filing of a formal application. This present application refers only to standing in the Commission's investigations of the cause of the loss as set out in Section 1 of the Terms of Reference and not to those matters set out in Section 2 of the Terms of Reference. Copies of the Terms of Reference can be obtained on request.

Please direct all correspondence and queries to:

**Royal Commission on the "OCEAN RANGER" Marine Disaster
P.O. Box 2400, Station "C", St. John's, Newfoundland A1C 6G3
Attention: Commission Secretary**

Telephone: (709) 772-4319 Telex: 016-4720

**Item A-5
List of Applicants with Standing**

STATUS:

Commission Counsel

Leonard A. Martin, Q.C.
David B. Orsborn

INTERESTED PARTIES WITH STANDING:

Counsel on behalf of ODECO Drilling of Canada
LimitedJohn J. O'Neill, Q.C.
George A. Frilot, III
Tucker H. Couvillon, III
Winston E. Rice
James Shuey
D. Richard RobbinsCounsel on behalf of Mobil Oil Canada
LimitedMichael F. Harrington
Janet M. Henley Andrews

Counsel on behalf of the American Bureau of Shipping

Thomas Coyne
David L. Russell, Q.C.

Counsel on behalf of the Government of Newfoundland

James L. Thistle

Counsel on behalf of Seaforth Maritime Limited and
Seabase Nova Scotia Limited

Kenneth A. MacInnis

Counsel on behalf of the Government of Canada

Norman J. Whalen
Dana LenehanCounsel on behalf of the Master, Officers and Crew,
Seaforth Highlander

Donald A. Kerr, Q.C.

Counsel on behalf of Watercraft America Inc.

John M. Green

Counsel on behalf of Next of Kin:

Leo D. Barry, Q.C.
Raymond J. Halley, Q.C.
A. Douglas Moores, Q.C.
Claude Sheppard, Jr.
John F. Roil
Robert B. Andrews
David F. Hurley
W. Gerard O'Dea
Bernard M. Coffey
John J. Harris
Gillian D. Butler
A. Dianne Fraser
John A. Bruce

OFFICIAL OBSERVERS:

The *Ocean Ranger* Families Foundation
The Workers' Compensation Board of Newfoundland & Labrador
The Newfoundland & Labrador Federation of Labour

Item A-6

Royal Commission on the
Ocean Ranger Marine Disaster

Canada



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

Newfoundland/Terre-Neuve

NOTICE OF INQUIRY

The Royal Commission on the Ocean Ranger Marine Disaster will commence public hearings at 10:00 a.m. on October 25, 1982 in the Canon Stirling Auditorium, Church of St. Mary the Virgin on Craigmillar Avenue in the City of St. John's in the Province of Newfoundland and Labrador.

This Notice of Inquiry is issued pursuant to the Ocean Ranger Marine Disaster Inquiry Rules.

Copies of the Terms of Reference and of the Inquiry Rules applying to that portion of the inquiry contained in paragraph one of those terms of reference, may be obtained by application to the Secretary:

David M. Grenville
Commission Secretary
Royal Commission on the Ocean Ranger
Marine Disaster
P. O. Box 2400, Station "C"
St. John's, Newfoundland
A1C 6G3

Item A-7
List of Witnesses Testifying During Part I Hearings

TRANSCRIPT	DATE 1982	NAME	CORPORATE AFFILIATION (FEBRUARY 1982)
Volume 1	October 25	MILNE, William	Professor of Engineering, Memorial University of Newfoundland
Volume 2	October 26	BORUM, John F.	Vice-President, American Bureau of Shipping
Volume 3 to Volume 5	October 27 to October 29	DILKS, Geoffrey	Master, <i>Ocean Ranger</i> , Ocean Drilling & Exploration Company
Volume 5 & Volume 6	October 29 & November 02	BAMBER, Peter John	Former Master, <i>Ocean Ranger</i> , Marine Superintendent, Ocean Drilling & Exploration Company
Volume 7	November 03	SKAUG, Erlend	Former Master, <i>Ocean Ranger</i> , (Hiroshima/ Alaska), Fearnley & Eger A/S
Volume 8	November 04	LIMA, Ordin	Former Master, <i>Ocean Ranger</i> , During Transits, Ocean Drilling & Exploration Company
Volume 8	November 04	SOERUM, Bjorn	Former Marine Engineer, <i>Ocean Ranger</i> , Fearnley & Eger A/S
Volume 9	November 05	GRANGER, George	Electrician, <i>Ocean Ranger</i> , Ocean Drilling & Exploration Company
Volume 10	November 08	WIKLUND, Svein	Former Electrician, <i>Ocean Ranger</i> , Fearnley & Eger A/S
Volume 10 to Volume 11	November 08 to November 09	MAJOR, Lloyd	Medic & Standby Radio Operator, <i>Ocean Ranger</i> , ODECO Drilling of Canada Limited
Volume 11	November 09	SHAW, Brian Walter	Former Radio Operator, <i>Ocean Ranger</i> , Service Engineer, Government of Canada
Volume 12	November 10	WILCOX, Ronald John	Department of Communications, Government of Canada
Volume 12	November 10	JANES, John Patrick	Department of Communications, Government of Canada
Volume 12	November 10	ROMANSKY, Stephen	East Coast Operations Manager, Mobil Oil Canada Limited
Volume 13	November 15	SPELLACY, Richard	President & Chief Executive Officer, Crosbie Offshore Services Limited
Volume 14	November 16	GOSSE, Raymond Gordon	Assistant Deputy Minister, Newfoundland & Labrador Petroleum Directorate

Volume 14 to Volume 15	November 16 to November 17	BRANDON, Lionel Victor	Director General, Engineering Branch, Canada Oil & Gas Lands Administration
Volume 15 to Volume 16	November 17 to November 18	HEWSON, Michael David	Manager, Environmental Forecasting Group, NORDCO Limited
Volume 16	November 18	PORTER, Stuart	Supervising Forecaster, Atmospheric Environmental Service, Gander, Government of Canada
Volume 16	November 18	SWAIL, Val	Climatologist, Atmospheric Environmental Service, Toronto, Government of Canada
Volume 16 to Volume 17	November 18 to November 19	WILSON, John Ronald	Director, Marine Environmental Data Service, Fisheries & Oceans, Ottawa, Government of Canada
Volume 18	December 06	Schedule Change	
Volume 19 to Volume 20	December 07 to December 08	HIMES, Clifford	Ballast Control Operator, <i>Ocean Ranger</i> , Ocean Drilling & Exploration Company
Volume 20 to Volume 21	December 08 to December 09	SIMPSON, Delmar	Electronic Technician, <i>Ocean Ranger</i> Ocean Drilling & Exploration Company
Volume 21 to Volume 22	December 09 to December 10	WILSON, John	Principal Surveyor, American Bureau of Shipping
Volume 22	December 10	ROMANSKY, Stephen	East Coast Operations Manager, Mobil Oil Canada Limited
Volume 23 to Volume 24	December 13 to December 14	JENNINGS, Frank	Former Ballast Control Operator, <i>Ocean Ranger</i> , Ocean Drilling & Exploration Company
Volume 24	December 14	FREEMAN, Geoffrey	Instructor, Petroleum Technology, College of Trades & Technology Former Inspector, Canada Oil & Gas Lands Administration
Volume 24	December 14	STRONG, Derek	Inspector, Canada Oil & Gas Lands Administration, Government of Canada
Volume 24	December 14	BURSEY, Maxwell	Director of Claims, Workers' Compensation Board
Volume 25	December 15	MCCANN, Ed P.	Director of Employment Services, Government of Newfoundland & Labrador
Volume 25	December 15	ENGLISH, William Joseph	Former Weather Observer, <i>Ocean Ranger</i> , MacLaren PlanSearch (FENCO)

TRANSCRIPT	DATE 1983	NAME	CORPORATE AFFILIATION (FEBRUARY 1982)
Volume 26 to Volume 27	March 08 to March 09	PORTER, Bruce	Ballast Control Operator, <i>Ocean Ranger</i> , ODECO Drilling of Canada Limited
Volume 27 to Volume 29	March 09 to March 11	NEHRING, Karl	Former Master, <i>Ocean Ranger</i> , Ocean Drilling & Exploration Company
Volume 29	March 11	COUNTS, Jimmy Earl	Drilling Superintendent, <i>Ocean Ranger</i> , Ocean Drilling & Exploration Company
Volume 30	March 14	TROXELL, George H., Jr.	Manager, Drilling Operations, Ocean Drilling & Exploration Company
Volume 31 to Volume 32	March 15 to March 16	COUNTS, Jimmy Earl	Drilling Superintendent, <i>Ocean Ranger</i> , Ocean Drilling & Exploration Company
Volume 32 to Volume 34	March 16 to March 18	GRAHAM, Mervin William	Area Drilling Superintendent, Grand Banks, Mobil Oil Canada Limited
Volume 35	March 21	KING, Baxter	Radio Operator, <i>SEDCO 706</i> , SEDCO 706 Drilling Company Limited
Volume 36	March 23	HIGDON, Jerry Woodrow	Second Mate, <i>MV Seaforth Highlander</i> , Seaforth Maritime Limited
Volume 37	March 24	JORGENSEN, Rolf	First Mate, <i>MV Seaforth Highlander</i> , Seaforth Maritime Limited
Volume 38	March 25	LIDSTONE, Kenneth Wayne	Seaman, <i>MV Seaforth Highlander</i> , Seaforth Maritime Limited
Volume 38	March 25	REES, Eric Norman	Seaman, <i>MV Seaforth Highlander</i> , Seaforth Maritime Limited
Volume 38	March 25	WOOLRIDGE, Wycliff Bert	Seaman, <i>MV Seaforth Highlander</i> , Seaforth Maritime Limited
Volume 38	March 25	CHAYTOR, Dennis Gerard	Seaman, <i>MV Seaforth Highlander</i> , Seaforth Maritime Limited
Volume 38	March 25	THOMPSON, Wayne	Cook, <i>MV Seaforth Highlander</i> , Seaforth Maritime Limited
Volume 39 to Volume 40	March 28 to March 29	DUNCAN, Ronald Stewart	Master Mariner, <i>MV Seaforth Highlander</i> , Seaforth Maritime Limited
Volume 40	March 29	TAVENOR, Christine	Radio Operator, St. John's, Mobil Oil Canada Limited
Volume 40 to Volume 41	March 29 to March 30	FLYNN, Richard	Radio Operator, St. John's, Mobil Oil Canada Limited

Volume 41 to Volume 42	March 30 to March 31	KING, Donald	Barge Engineer, <i>SEDCO 706</i> , SEDCO 706 Drilling Company Limited
Volume 42	March 31	LOVELL, Kenneth	Senior Drilling Foreman, <i>Zapata Uglan</i> , Mobil Oil Canada Limited
Volume 43	April 05	SENKOE, Keith	Drilling Foreman, <i>SEDCO 706</i> , Mobil Oil Canada Limited
Volume 44	April 06	EBY, James	Chief Engineer, <i>MV Boltentor</i> , Crosbie Offshore Services Limited
Volume 44	April 06	GUPTILL, Clinton	First Mate, <i>MV Boltentor</i> , Crosbie Offshore Services Limited
Volume 45	April 07	ALLINGHAM, Baxter	Master, <i>MV Nordertor</i> , Crosbie Offshore Services Limited
Volume 46	May 16	GERNANDT, Kelvin (Blondie)	Operations Manager, St. John's, Ocean Drilling & Exploration Company
Volume 47	May 17	URSULAK, William John	Drilling Foreman, <i>SEDCO 706</i> , Mobil Oil Canada Limited
Volume 47	May 17	HATCHER, Fred	Watchstander / Ballast Control Operator, <i>SEDCO 706</i> , SEDCO 706 Drilling Company Limited
Volume 48	May 18	BOURQUE, Leo	Watchstander / Ballast Control Operator, <i>SEDCO 706</i> , SEDCO 706 Drilling Company Limited
Volume 48 to Volume 49	May 18 to May 19	FRASER, Rod	Drilling Foreman, <i>SEDCO 706</i> , Mobil Oil Canada Limited
Volume 49	May 19	DAVISON, James	Master, <i>MV Boltentor</i> , Crosbie Offshore Services Limited
Volume 50	May 20	MARTIN, Malcolm Alan	Second Mate, <i>MV Boltentor</i> , Crosbie Offshore Services Limited
Volume 50	May 20	KANE, Thomas	Deckhand, <i>MV Boltentor</i> , Crosbie Offshore Services Limited
Volume 51	May 24	MYDLAND, Jan Arthur	Master, <i>Zapata Uglan</i> , Zapata Drilling Company
Volume 51	May 24	POWER, William	Radio Operator, Ministry of Transport, Government of Canada
Volume 51 to Volume 53	May 24 to May 26	BEATTIE, Ken	Logistics Supervisor, Hibernia Area, Mobil Oil Canada Limited
Volume 53	May 26	HUTCHINGS, Bruce Reginald	Co-pilot, Universal Helicopters, St. John's
Volume 54	May 27	PREUS, Rudolph Victor	Aircraft Commander, Search & Rescue, 103 Rescue Unit, Gander

Volume 54	May 27	CLARKE, George Michael	Aircraft Commander, Search & Rescue, 103 Rescue Unit, Gander
Volume 54	May 27	BROWN, Randall Keith	Search & Rescue Technician, 103 Rescue Unit, Gander
Volume 55	May 30	BARNES, Albert Grenville	Marine Co-ordinator, Search & Rescue Emergency Centre, St. John's
Volume 55	May 30	REHSE, Fred Major	Commanding Officer, Search and Rescue, 103 Rescue Unit, Gander
Volume 55	May 30	PIKE, Dr. Eric	Forensic Pathologist, General Hospital Health Sciences Centre
Volume 56	May 31	LEONARD, Bernard Michael	Rescue Officer, Canadian Coast Guard, Search & Rescue Emergency Centre, St. John's
Volume 56	May 31	MAWHINNEY, John	Duty (Air)Controller, Rescue Co-ordination Centre, Halifax
Volume 56	May 31	GILLIS, Colin	Commanding Officer, Rescue Co-ordination Centre, Halifax
Volume 57	June 01	FAHEY, Patrick Joseph	Second Mate, <i>MV Nordertor</i> , Crosbie Offshore Services
Volume 57	June 01	GALLAGHER, Robert	Technical Co-ordinator, Royal Air Force Special Exchange Assignment Greenwood, Nova Scotia
Volume 57	June 01	RUELOKKE, Max	Vice President & General Manager, Hydrospace Marine Services
Volume 58	June 02	Schedule Change	
Volume 59	July 19	OLSEN, Mikkjal	Master, Faroese Fishing Vessel <i>Sigurfari</i> Operated by Hewson & Olsen, Faroe Islands
Volume 60	September 12	MARKLE, Robert Louis	Chief, Survival Systems Branch, United States Coast Guard, Washington, D.C.
Volume 61	September 13	VERMIJ, Maximillian	Electrical-Mechanical Analysis Specialist, Aviation Safety Bureau, Transport Canada
Volume 62	September 14	BAIKOWITZ, Harry	President, Technitrol Canada Limited
Volume 62 to Volume 64	September 14 to September 16	VERMIJ, Maximillian	Electrical-Mechanical Analysis Specialist, Aviation Safety Bureau, Transport Canada

Volume 65 to Volume 66	November 21 to November 22	McDONALD, Hamish	Manager, Maritime Rescue Section, Robert Gordon Institute of Technology Offshore Survival Centre, Stonehaven, Scotland
Volume 66	November 22	WRIGHT, Keith	Chief Engineer, <i>MV Seaforth Highlander</i> , Seaforth Maritime Limited
Volume 66	November 22	SCAMMEL, Derek	Third Engineer, <i>MV Seaforth Highlander</i> , Seaforth Maritime Limited
Volume 66 to Volume 67	November 22 to November 23	CADD, Roger	Chartering Manager, Seaforth Fednav
Volume 67	November 23	SNOW, Dr. Wayne John	Shore-based Medical Advisor To <i>Ocean Ranger</i> crew members
Volume 67	November 23	SKILLMAN, Mark Robert	Senior Ships Surveyor, Lloyd's Register of Shipping, London
Volume 68	November 24	ATKINSON, Frederick Harper	Head, Offshore Services Group, Lloyd's Register of Shipping, London
Volume 68	November 24	KAPRAL, Peter	Drilling Foreman, Mobil Oil Canada Limited
Volume 68	November 24	DAVIES, Brinley Moore	Chief, Communications & Computer Engineering Division, Canadian Coast Guard
Volume 68	November 24	ASHFORD, Angus	First Mate, <i>MV Cape Fox</i> , National Sea Products Limited
Volume 69	November 28	STEIMLER, Gustav Adolf	Director, Norwegian Sea Rescue Association, Oslo, Norway
Volume 69	November 28	STEVENSON, Ronald	Manager, Liferaft Department, IMP Group Limited
Volume 69	November 28	O'DONNELL, James Joseph	Inspector, Liferrafts, IMP Group Limited
Volume 70	November 29	BERTHIER, Joseph Edgar (Wayne)	Former Safety Engineer, ODECO Drilling of Canada Limited
Volume 70	November 29	TURNER, Daniel	Seaman, <i>MV Boltentor</i> , Crosbie Offshore Services Limited
Volume 71	November 30	HALFWEEG, Nan	Managing Director, Wijsmuller Salvage B.V.
Volume 71	November 30	GREER, John	Director, Emergency Measures Organization, Government of Newfoundland & Labrador
Volume 72	December 01	LEGER, Donald R.	Former Senior Toolpusher, <i>Ocean Ranger</i> , Ocean Drilling & Exploration Company

TRANSCRIPT	DATE 1984	NAME	CORPORATE AFFILIATION (FEBRUARY 1982)
Volume 72A	January 30	Schedule Change	
Volume 73 to Volume 74 & Volume 76 (pp. 12251a - 12251c)	February 27 to February 28 & March 01	LOOMIS, Ralph W.	Supervisor of Mechanical & Drilling Engineering, ODECO Engineers Inc.
Volume 75	February 29	ADAMS, Michael Morris	Supervisor, Naval Architects, ODECO Engineers Inc.
Volume 75 to Volume 76	February 29 to March 01	PETTY, Dr. Terry Don	President, ODECO Engineers Inc.
Volume 77	March 02	VERMIJ, Maximillian	Electrical-Mechanical Analysis Specialist, Aviation Safety Bureau, Transport Canada
Volume 78 to Volume 82 & Volume 83 to Volume 85	March 05 to March 09 & March 12 to March 14	CORLETT, Dr. Ewan Christian	Naval Architect, Ship Designer & Marine Consultant, Burness, Corlett & Partners (IOM) Limited
SUMMATIONS			
Volume 86	March 20	MARTIN, Leonard A., Q.C.	Commission Counsel, Royal Commission on the <i>Ocean Ranger</i> Marine Disaster
Volume 86	March 20	WHALEN, Norman J.	Counsel, Government of Canada
Volume 86	March 20	THISTLE, James L.	Counsel, Government of Newfoundland & Labrador
Volume 86	March 20	COYNE, Thomas	Counsel, American Bureau of Shipping
Volume 86 to Volume 87	March 20 to March 21	MACINNIS, Kenneth A.	Counsel, Seaforth Maritime & Seabase Nova Scotia Limited
Volume 87	March 21	HARRINGTON, Michael F.	Counsel, Mobil Oil Canada Limited
Volume 87 to Volume 88	March 21 to March 22	FRILOT, George A., III	Counsel, ODECO Drilling of Canada Limited
Volume 88	March 22	ORSBORN, David B.	Associate Commission Counsel, Royal Commission on the <i>Ocean Ranger</i> Marine Disaster

Item A-8
Alphabetical List of Witnesses

NAME	TRANSCRIPT	DATE
ADAMS, Michael Morris	Volume 75	February 29, 1984
ALLINGHAM, Baxter	Volume 45	April 07, 1983
ASHFORD, Angus	Volume 68	November 24, 1983
ATKINSON, Frederick Harper	Volume 68	November 24, 1983
BAIKOWITZ, Harry	Volume 62	September 14, 1983
BAMBER, Peter John	Volume 5 & Volume 6	October 29, 1982 & November 02, 1982
BARNES, Albert Grenville	Volume 55	May 30, 1983
BEATTIE, Ken	Volume 51 to Volume 53	May 24, 1983 to May 26, 1983
BERTHIER, Joseph Edgar (Wayne)	Volume 70	November 29, 1983
BORUM, John F.	Volume 2	October 26, 1982
BOURQUE, Leo	Volume 48	May 18, 1983
BRANDON, Lionel Victor	Volume 14 to Volume 15	November 16, 1982 to November 17, 1982
BROWN, Randall Keith	Volume 54	May 27, 1983
BURSEY, Maxwell	Volume 24	December 14, 1982
CADD, Roger	Volume 66 to Volume 67	November 22, 1983 to November 23, 1983
CHAYTOR, Dennis Gerard	Volume 38	March 25, 1983
CLARKE, George Michael	Volume 54	May 27, 1983
CORLETT, Dr. Ewan Christian	Volume 78 to Volume 82 & Volume 83 to Volume 85	March 05, 1984 to March 09, 1984 & March 12, 1984 to March 14, 1984
COUNTS, Jimmy Earl	Volume 29 & Volume 31 to Volume 32	March 11, 1983 & March 15, 1983 to March 16, 1983

DAVISON, James	Volume 49	May 19, 1983
DAVIES, Brinley Moore	Volume 68	November 24, 1983
DILKS, Geoffrey	Volume 3 to Volume 5	October 27, 1982 to October 29, 1982
DUNCAN, Ronald Stewart	Volume 39 to Volume 40	March 28, 1983 to March 29, 1983
EBY, James	Volume 44	April 06, 1983
ENGLISH, William Joseph	Volume 25	December 15, 1982
FAHEY, Patrick Joseph	Volume 57	June 01, 1983
FLYNN, Richard	Volume 40 to Volume 41	March 29, 1983 to March 30, 1983
FRASER, Rod	Volume 48 to Volume 49	May 18, 1983 to May 19, 1983
FREEMAN, Geoffrey	Volume 24	December 14, 1982
GALLAGHER, Robert	Volume 57	June 01, 1983
GERNANDT, Kelvin (Blondie)	Volume 46	May 16, 1983
GILLIS, Colin	Volume 56	May 31, 1983
GOSSE, Raymond Gordon	Volume 14	November 16, 1982
GRAHAM, Mervin William	Volume 32 to Volume 34	March 16, 1983 to March 18, 1983
GRANGER, George	Volume 9	November 05, 1982
GREER, John	Volume 71	November 30, 1983
GUPTILL, Clinton	Volume 44	April 06, 1983
HALFWEEG, Nan	Volume 71	November 30, 1983
HATCHER, Fred	Volume 47	May 17, 1983
HEWSON, Michael David	Volume 15 to Volume 16	November 17, 1982 to November 18, 1982
HIGDON, Jerry Woodrow	Volume 36	March 23, 1983
HIMES, Clifford	Volume 19 to Volume 20	December 07, 1982 to December 08, 1982

HUTCHINGS, Bruce Reginald	Volume 53	May 26, 1983
JANES, John Patrick	Volume 12	November 10, 1982
JENNINGS, Frank	Volume 23 to Volume 24	December 13, 1982 to December 14, 1982
JORGENSEN, Rolf	Volume 37	March 24, 1983
KANE, Thomas	Volume 50	May 20, 1983
KAPRAL, Peter	Volume 68	November 24, 1983
KING, Baxter	Volume 35	March 21, 1983
KING, Donald	Volume 41 to Volume 42	March 30, 1983 to March 31, 1983
LEGER, Donald R.	Volume 72	December 01, 1983
LEONARD, Bernard Michael	Volume 56	May 31, 1983
LIDSTONE, Kenneth Wayne	Volume 38	March 25, 1983
LIMA, Ordin	Volume 8	November 04, 1982
LOOMIS, Ralph W.	Volume 73 to Volume 74 & Volume 76 (pp. 12251a -12251c)	February 27, 1984 to February 28, 1984 & March 01, 1984
LOVELL, Kenneth	Volume 42	March 31, 1983
MAJOR, Lloyd	Volume 10 to Volume 11	November 08, 1982 to November 09, 1982
MARKLE, Robert Louis	Volume 60	September 12, 1983
MARTIN, Malcolm Alan	Volume 50	May 20, 1983
MCCANN, Ed P.	Volume 25	December 15, 1982
MCDONALD, Hamish	Volume 65 to Volume 66	November 21, 1983 to November 22, 1983
MAWHINNEY, John	Volume 56	May 31, 1983
MILNE, William	Volume 1	October 25, 1982
MYDLAND, Jan Arthur	Volume 51	May 24, 1983

NEHRING, Karl	Volume 27 to Volume 29	March 09, 1983 to March 11, 1983
O'DONNELL, James Joseph	Volume 69	November 28, 1983
OLSEN, Mikkjal	Volume 59	July 19, 1983
PETTY, Dr. Terry Don	Volume 75 to Volume 76	February 29, 1984 to March 01, 1984
PIKE, Dr. Eric	Volume 55	May 30, 1983
PORTER, Bruce	Volume 26 to Volume 27	March 08, 1983 to March 09, 1983
PORTER, Stuart	Volume 16	November 18, 1982
POWER, William	Volume 51	May 24, 1983
PREUS, Rudolph Victor	Volume 54	May 27, 1983
REES, Eric Norman	Volume 38	March 25, 1983
REHSE, Major Fred	Volume 55	May 30, 1983
ROMANSKY, Stephen	Volume 12 & Volume 22	November 10, 1982 & December 10, 1982
RUELOKKE, Max	Volume 57	June 01, 1983
SCAMMEL, Derek	Volume 66	November 22, 1983
SENKOE, Keith	Volume 43	April 05, 1983
SHAW, Brian Walter	Volume 11	November 09, 1982
SIMPSON, Delmar	Volume 20 to Volume 21	December 08, 1982 to December 09, 1982
SKAUG, Erlend	Volume 7	November 03, 1982
SKILLMAN, Mark Robert	Volume 67	November 23, 1983
SNOW, Dr. Wayne John	Volume 67	November 23, 1983
SOERUM, Bjorn	Volume 8	November 04, 1982
SPELLACY, Richard	Volume 13	November 15, 1982
STEIMLER, Gustav Adolf	Volume 69	November 28, 1983
STEVENSON, Ronald	Volume 69	November 28, 1983
STRONG, Derek	Volume 24	December 14, 1982

SWAIL, Val	Volume 16	November 18, 1982
TAVENOR, Christine	Volume 40	March 29, 1983
THOMPSON, Wayne	Volume 38	March 25, 1983
TROXELL, George H., Jr.	Volume 30	March 14, 1983
TURNER, Daniel	Volume 70	November 29, 1983
URSULAK, William John	Volume 47	May 17, 1983
VERMIJ, Maximillian	Volume 61 to Volume 64 & Volume 77	September 13, 1983 to September 16, 1983 & March 02, 1984
WIKLUND, Svein	Volume 10	November 08, 1982
WILCOX, Ronald John	Volume 12	November 10, 1982
WILSON, John	Volume 21 to Volume 22	December 09, 1982 to December 10, 1982
WILSON, John Ronald	Volume 16 to Volume 17	November 18, 1982 to November 19, 1982
WOOLRIDGE, Wycliff Bert	Volume 38	March 25, 1983
WRIGHT, Keith	Volume 66	November 22, 1983
SUMMATIONS		
COYNE, Thomas	Volume 86	March 20, 1984
FRILOT, George A., III	Volume 87 to Volume 88	March 21, 1984 to March 22, 1984
HARRINGTON, Michael F.	Volume 87	March 21, 1984
MACINNIS, Kenneth A.	Volume 86 to Volume 87	March 20, 1984 to March 21, 1984
MARTIN, Leonard A., Q.C.	Volume 86	March 20, 1984
ORSBORN, David B.	Volume 88	March 22, 1984
THISTLE, James L.	Volume 86	March 20, 1984
WHALEN, Norman J.	Volume 86	March 20, 1984

Item A-9
List of Exhibits Introduced During Part I Hearings

- 1 The Government of Canada Order in Council, PC 1982-819, March 17, 1982.
- 2 The Government of Newfoundland and Labrador Order in Council, March 16, 1982.
- 3 *Ocean Ranger* Data Profile issued by ODECO Engineers, Inc.
- 4 Certificate of Registry issued at New Orleans, Louisiana, by the United States Coast Guard, August 5, 1980.
- 5 Certificate of Inspection completed and issued at Providence, Rhode Island, by the United States Coast Guard, December 27, 1979.
- 6 Certificate of Cargo Ship Safety Equipment issued at New York, by the United States Coast Guard, December 27, 1980.
- 7 International Load Line Certificate issued at New York, by the American Bureau of Shipping, on behalf of United States Coast Guard, October 30, 1981.
- 8 Cargo Ship Safety Construction Certificate issued at New York, by the American Bureau of Shipping, on behalf of United States Coast Guard, April 28, 1980.
- 9 Cargo Ship Safety Radiotelegraphy Certificate issued at St. John's, Newfoundland, by the American Bureau of Shipping, under the authority of the Government of Canada, April 16, 1981.
- 10 Certificate of Annual Examination of Gear issued at St. John's, Newfoundland, by the American Bureau of Shipping, June 16, 1981.
- 11 Builder's Certificate issued by Mitsubishi Heavy Industries, Limited, Tokyo, Japan, May 28, 1976.
- 12 Certificate of Admeasurement issued by the United States Coast Guard, at New Orleans, Louisiana, December 21, 1979 and at Philadelphia, Pennsylvania, June 30, 1980.
- 13 Designation of Home Port of Vessel issued at New Orleans, Louisiana, by the United States Coast Guard, June 26, 1980.
- 14 Oaths of Registry, Licence of Vessel, issued at New Orleans, Louisiana, by the United States Coast Guard, June 24, 1980.
- 15 Sea-Jay Elliot Inflatable Life Rafts Certificate of Service, issued by IMP Group Limited, May-July, 1981. Serial Nos. 20, 710-714.
- 15A Sea-Jay Elliot Inflatable Life Rafts Certificate of Service, issued by IMP Group Limited, April-July, 1981. Serial Nos. 715 to 718.
- 15B Descriptive Literature for Sea-Jay Elliot Liferrafts.
- 16 *Ocean Ranger* Emergency Procedures issued by ODECO Drilling of Canada Limited.
- 17 Emergency Muster List, Fire or Abandon Ship Procedure for the *Ocean Ranger*.
- 18 *SEDCO 706*, Radio Logs & Weather, February 14-17, 1982.
- 19 *SEDCO 706*, Barge Control Log, February 1-20, 1982.
- 19A Typed Transcript of Exhibit 19, *SEDCO 706* Barge Control Log, February 14-15, 1982.
- 20 *SEDCO 706*, Barge Control Sheets, February 1-16, 1982.
- 21 Mobil Base Radio Logs for February 9-17, 1982.
- 21A Typed Transcript of Exhibit 21, Mobil Base Radio Logs for February 9-17, 1982.
- 22 Canadian Coast Guard Radio Log, St. John's, February 15-21, 1982.
- 23 Universal Helicopter Dispatcher's Log, February 15, 1982.
- 24 *Ocean Ranger* P.M. Status Reports to ODECO Drilling of Canada Limited, St. John's, February 1-14, 1982.

- 25 United States Coast Guard Informal Inspection Report by Lieutenant Commander Purtell, November 2, 1981.
- 26 *MV Nordertor* Radio Log, February 5-15, 1982.
- 26A Typed Transcript of Exhibit 26, *MV Nordertor* Radio Log, February 14-15, 1982.
- 27 ODECO Drilling of Canada Limited and Mobil Oil Canada Limited, Drilling Agreement, February 28, 1980, and October 16th, 1981, Extension.
- 28 Marisat Service Billing Record, February 1-15, 1982 – *Ocean Ranger*; February 1-16, 1982 – *SEDCO 706*.
- 29 Marisat Service Billing Record, January 15 – February 16, 1982 – *Ocean Ranger*.
- 30 Operational History of the *Ocean Ranger*, June 30, 1976 – February 14, 1982.
- 31 Mobil Oil Canada Limited Dispatchers Log, February 13-17, 1982.
- 32 *MV Nordertor* Deck Log, February 15, 1982.
- 32A Typed Transcript of Exhibit 32, *MV Nordertor* Deck Log, February 15, 1982.
- 33 Annual Class Survey issued by American Bureau of Shipping, June 17, 1981.
- 34 *Ocean Ranger* Weekly Stability Report, February 1, 1982.
- 34A *Ocean Ranger* Weekly Stability Report, February 11, 1982.
- 34B *Ocean Ranger* Drilling Report, February 10, 1982.
- 34C *Ocean Ranger* Stability Report, February 9, 1982.
- 35 Particulars of Watercraft Lifeboat, Rescue Boat & Davits.
- 36 Watercraft Lifeboat Brochures by Watercraft America Limited.
- 37 Assembly Diagram of Watercraft Lifeboat Davit.
- 38 Norwegian Certificates for Lifeboat Equipment issued by A/S Nor Davit, Bergen, and the manufacturers, according to regulations by Norwegian Maritime Directorate.
- 39 Anchoring Report, Hibernia Field Block #J-34, November 29, 1981.
- 40 Tuktoyaktuk Radio Message received from *Ocean Ranger* at 0442 Zulu (1:12 NST), February 14, 1982.
- 41 Final Identification List of *Ocean Ranger* On Duty Employees; including addresses, family contacts, etc.
- 42 *MV Boltentor* Deck Log, February 14-22, 1982.
- 42A Typed Transcript of Exhibit 42, *MV Boltentor* Deck Log, February 14-15, 1982.
- 43 Rescue Co-ordination Centre Operators' Logs, February 15-16, 1982.
- 44 Rescue Co-ordination Centre "B" Stand Log, February 15-17, 1982.
- 45 Search and Rescue Emergency Centre Case File, February 15, 1982, Notes & Hard Copy.
- 46 Search and Rescue Emergency Centre Case File, February 16, 1982, Notes & Hard Copy.
- 47 Search and Rescue Emergency Centre Case File, February 17, 1982, Notes & Hard Copy.
- 48 Canadian Coast Guard Ship *Bartlett*, Search and Rescue Summary, February 16-24, 1982.
- 49 Canadian Coast Guard Ship *Jackman*, Search and Rescue Summary, February 19-24, 1982.

- 50 *Ocean Ranger* Inspection Reports by Canada Oil and Gas Lands Administration from April 15, 1980 to February 4, 1982.
- 51 *Ocean Ranger* Booklet of Operating Conditions prepared by ODECO Engineers Inc., approved by American Bureau of Shipping, January 21, 1977.
- 51A *Ocean Ranger* Booklet of Operating Conditions approved by United States Coast Guard, January 6, 1981.
- 52 Permit to Drill Hibernia J-34 issued to Mobil Oil Canada Limited by Canada Oil and Gas Lands Administration, October 13, 1981. Well Status for Hibernia J-34 as of February 16, 1982.
- 53 Mobil Oil Plan of Survey, Hibernia J-34, by McElhanney Surveying & Engineering Limited, issued December 9, 1981.
- 54 American Bureau of Shipping Correspondence to Canada Oil and Gas Lands Administration February 18, 1982 re: Classification Status and Surveys from May, 1978.
- 55 American Bureau of Shipping Examination and Report upon Annual Survey of Hull and Machinery, Annual Load Line Inspection, issue of Provisional Load Line Certificate and examination of vessel's underwater body. Survey No. PA4720, April 8, 1980.
- 56 American Bureau of Shipping Certification, Column Stabilized Drilling Unit AMS, February 11, 1980.
- 57 "Model Tests of the *Ocean Ranger* a Semi-submersible Drilling Rig", conducted by Offshore Technology Corporation for Ocean Drilling and Exploration Company, May 1974.
- 58 *Ocean Ranger* General Plan List drawn on May 28, 1976.
- 59 Marine Synopsis for Newfoundland issued from Gander Weather Office by Environment Canada for February 11-16, 1982.
- 60 Site Specific Weather Forecasts issued by NORDCO Limited to Mobil Oil Canada Limited for February 13-17, 1982.
- 61 Supplementary Weather Observations, Private Aviation Weather Reporting Service (PAWRS) Logs for *SEDCO 706* and *Zapata Uglund*, February 12-18, 1982.
- 62 MacLaren-Marex Daily Observations Log, *Zapata Uglund*, February 13-16, 1982.
- 63 Canadian Forces Metoc Centre Wave Analysis, February 10-16, 1982.
- 64 Synoptic Reports prepared by Atmospheric Environment Centre, Gander for February 11-16, 1982.
- 65 *Ocean Ranger* Quarters General Arrangement, 2nd and 3rd Floors.
- 66 Distress Telex transmitted from the *Ocean Ranger* to the United States Coast Guard, Rescue Coordination Centre, New York 0439 Zulu (0109 NST), February 15, 1982.
- 67 Mobil Oil Canada Limited Contingency Plans & Emergency Procedures, August 1980.
- 68 List of Contractors to *Zapata Uglund*, *SEDCO 706* and *Ocean Ranger*.
- 69 Maps of Hibernia Well Sites provided by Newfoundland and Labrador Petroleum Directorate.
- 70 *Ocean Ranger* Mooring Pattern provided by Newfoundland and Labrador Petroleum Directorate.
- 71 St. John's Coast Guard Radio Communications with *Ocean Ranger* for January 1 – February 13, 1982.
- 72 St. John's Coast Guard Radio (VON) Log, February 15, 1982.
- 73 Installation of 58-Man Watercraft Lifeboat Arrangement, April 1, 1980.
- 74 Atlantic Weather Centre Six Hour Surface Analysis, February 11-17, 1982.
- 74A Twenty-seven Enhanced Drawings of *Ocean Ranger*, redrafted from as-built plans, including:
General arrangement,
Control room layout,
Safety equipment.

- 74B** *Ocean Ranger* as-built plans:
 Arrangement of Pressure Gauge and Alarm Lamp – Drawing No. NMA 298-1-3B
 Mimic Diagram of Control Face (Port Hull) – Drawing No. NMA 298-1-2
 Mimic Diagram of Control Face (Starboard Hull) – Drawing No. NMA 298-1-1
 Slides No. 070, 071, 072, respectively.
- 75** American Bureau of Shipping Statement for Hearings of the Royal Commission on the *Ocean Ranger* Marine Disaster October 26, 1982.
- 76** American Bureau of Shipping – Rules for Building and Classing Mobile Offshore Drilling Units 1973.
- 76A** American Bureau of Shipping – Rules for Building and Classing Mobile Offshore Drilling Units 1973, Appendix B.
- 77** American Bureau of Shipping – Rules for Building and Classing Mobile Offshore Drilling Units, 1980.
- 78** Initial Request by Ocean Drilling and Exploration Company for American Bureau of Shipping Classification.
- 79** American Bureau of Shipping – Formal Request for Classification Survey by Mitsubishi Heavy Industries Limited, January 24, 1974.
- 80** American Bureau of Shipping – Survey for Load Lines July 30, 1975, Report KU9170.
- 81** American Bureau of Shipping – Particulars for Class Certificates:
 Hull Classification Report;
 Report on Main Propulsion Internal Combustion Engines;
 Report on Electrical Propulsion Machinery;
 Supplementary Report on Machinery, Pumps and Piping;
 Report on Ships Service Electrical Equipment;
 Reports on Castings or Forcings.
- 82** American Bureau of Shipping – Tests on Main Propulsion D.C. Generators for *Ocean Ranger*.
- 83** American Bureau of Shipping – Reports/Certificates:
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|---|-----------|------------------|
| Survey Report and Cargo Ship Safety Construction Certificate | KU9787 | May 28, 1976 |
| Report of Annual Load Line Inspection | S13971 | December 2, 1976 |
| Load Line Certificate | 61-30,895 | May 5, 1977 |
| Report on Annual Load Line Inspection | SF25645 | June 21, 1977 |
| Annual Survey of Hull and Machinery | SF 25644 | June 21, 1977 |
| Report of Annual Load Line Inspection | S15572 | May 26, 1978 |
| Underwater Survey, Seward, Alaska | S15571 | October 24, 1978 |
| Report on Propellor Damage | S15573 | October 24, 1978 |
| Report on Boat Bumper | VA7476 | January 13, 1979 |
| Report on Boat Damage | VA7728 | March 6, 1979 |
| Survey Report and Cargo Ship Safety Construction Certificate | VA7687 | July 5, 1979 |
| Report of Annual Load Line Inspection | VA7729 | July 5, 1979 |
| Report of Annual Load Line Inspection | PA4720 | April 8, 1980 |
| Survey Report and Cargo Ship Safety Construction Certificate | PA4724 | April 8, 1980 |
| Underwater Survey, Wilmington Canyon, Atlantic City, New Jersey | PA4936 | April 8, 1980 |
| Report of Annual Load Line Inspection | 2915 | June 17, 1981 |
- 84** American Bureau of Shipping – Register and Certificates of Cargo Gear, Kure, Japan, May 28, 1976.
- 85** American Bureau of Shipping – Reports on Safety Equipment from March 1 to May 28, 1976.
- 86** American Bureau of Shipping – Reports on Radiotelegraphy Installation, July 30, 1976; June 24, 1977; June 20, 1978; May 18, 1979.
- 87** American Bureau of Shipping Correspondence re: Booklet of Operating Conditions:
- 1) American Bureau of Shipping to ODECO Engineers Inc., January 21, 1977
 - 2) American Bureau of Shipping to ODECO Engineers Inc., April 13, 1977
 - 3) ODECO Engineers Inc. to American Bureau of Shipping, November 9, 1977.

- 88** American Bureau of Shipping Correspondence re: Stability
- 1) United States Coast Guard to Ocean Drilling & Exploration Company, December 13, 1979
 - 2) United States Coast Guard to Ocean Drilling & Exploration Company, December 16, 1979
 - 3) United States Coast Guard to Ocean Drilling & Exploration Company, January 6, 1981.
- 89** American Bureau of Shipping Stability Calculations, 115 pages, January 1979.
- 90** American Bureau of Shipping File Correspondence to Ocean Drilling & Exploration Company, 51 pages.
- 91** American Bureau of Shipping Comparative Data for *Ocean Ranger*, *SEDCO 706* and *Zapata Uglad*.
- 92** Ocean Drilling & Exploration Company *Ocean Ranger* Promotional Film.
- 93** *Ocean Ranger* Photographs Numbers 1-34 presented by Captain Erlend Skaug, former Master, *Ocean Ranger*.
- 94** Ballast Control Console Drawings No. P-3113, thirty-one pages including cover.
- 95** Photo: Radio Room, *Ocean Ranger* presented by Lloyd Major, Radio Operator, *Ocean Ranger*.
- 96** Certificate of Lifeboat Instruction issued to Lloyd Major, Radio Operator, by Karl Nehring, former Master, *Ocean Ranger*.
- 97** Curriculum Vitae, Lloyd Major, Radio Operator, *Ocean Ranger*.
- 98** Photo: MARISAT Radio on *Ocean Ranger* presented by Lloyd Major, Radio Operator.
- 99** Department of Communications, Correspondence relating to Inspection and Certification of *Ocean Ranger* Radio Equipment, April 1981.
- 100** "A Guide to Marine Radiotelephone Operation", issued under authority of Department of Communications, Atlantic Region, Canada.
- 101** OSA 851 *Nordertor* Offshore Supply Association Limited Outline Specifications.
- 102** Contracts between Crosbie Enterprises and Mobil Oil Canada Limited for services of Supply Vessels *Boltentor* and *Nordertor*.
- 103A** Rescue Equipment onboard six Crosbie Offshore Supply Vessels as of August 1982.
- 103B** Radar Equipment onboard six Crosbie Offshore Supply Vessels as of May 1981.
- 103C** Radio Equipment onboard six Crosbie Offshore Supply Vessels as of May 1981.
- 104A** General Arrangement Offshore Standby Rescue Vessel Drawing Number: 8219P-01 – Scale: 1:100, October 1982.
- 104B** Transparency: General Arrangement Offshore Standby Rescue Vessel; Drawing Number: 8219P-01 – Scale: 1:100, October 1982.
- 104C** Specifications of Offshore Standby Vessel, 2 pages, signed by C. A. Nicol, Vice-President, SEAGEM Inc.
- 105**
- 1) Notice to all Permittees from Department of Mines & Energy, February 2, 1979;
 - 2) Volume 5 Physical and Environmental Considerations Mobil et al: Hibernia J-34;
 - 3) Approval for Drilling: Hibernia J-34 by Newfoundland and Labrador Petroleum Directorate, November 13, 1981.
- 106** Guidelines and Procedures under Certain Sections of the Newfoundland and Labrador Petroleum Regulations, 1977 issued under the authority of the Minister of Mines and Energy, November 30, 1978.
- 107** Province of Newfoundland and Labrador Accidental Occurrences Contingency Plans Concerning Offshore Petroleum Related Activity, July, 1981.
- 108**
- 1) Notice of Authority to Drill a Well issued by Canada Oil and Gas Lands Administration, October 13, 1981;
 - 2) Drilling Program Approval issued by Energy, Mines & Resources, October 29, 1981;
 - 3) Authority to Drill a Well issued by Energy, Mines & Resources, November 12, 1981.
- 109**
- 1) Mobil Oil Canada Limited Grand Banks Oil Spill Contingency Plan, Revised July 1981, Unit 1, Action Manual;
 - 2) Mobil Oil Canada Limited Grand Banks Contingency Plan, April 1980, Unit 2, Supporting Environmental Information Manual.

- 110 Telex from Canada Oil and Gas Lands Administration to Mobil Oil Canada Limited, March 11, 1982, re: Requirements for return to sea of the *SEDCO 706* and the *Zapata Uglan*d.
- 111 Information and Procedures for Offshore Operators issued by Energy, Mines & Resources Canada, 8th Issue, April, 1979, Report E1 79-4.
- 112 Extract from NORDCO Limited Forecast Interpretation Manual, pages 2-8, provided by Michael Hewson, Manager.
- 113 Precis of Weather Information for February 14-15, 1982 and Supplementary Aviation Weather Observations for *Zapata Uglan*d and *SEDCO 706*.
- 114 NORDCO Limited Forecast Verification Graphs for February 14-15, 1982.
- 115 Telex from NORDCO Limited to Mobil Oil Canada Limited September 1, 1982 re: Definition of Parameters in Site Specific Forecasts.
- 116 Graphs of Weather Forecasts, February 13-15, 1982, 10 pages, presented by Commissioner Pardy.
- 117 Marine Forecast and Weather Observations for February 14-15, 1982, presented by Stuart Porter, Weather Observer, Atmospheric Environment Centre.
- 118
 - 1) Wave Record Information for Station 140, *Zapata Uglan*d Identification No. 18-2-104;
 - 2) Maximum Wave Height Statistics, Tape No. 103, February 11-15, 1982;
 - 3) Characteristic Height in Metres for Station 140, *Zapata Uglan*d and 156, *Ocean Ranger* for January – February, 1982.
- 119 Wave Data from the *Zapata Uglan*d, Station 140, February 14-16, 1982.
- 120
 - 1) *Ocean Ranger* A.M. Status Report to ODECO Drilling of Canada Limited, St. John's for February 9, 1982;
 - 2) *Ocean Ranger* Stability Report for February 9, 1982;
 - 3) *Ocean Ranger* A.M. Status Report to ODECO Drilling of Canada Limited, St. John's for February 14, 1982;
 - 4) *Ocean Ranger* Stability Report dated February 9, 1982, Working Copy for February 14, 1982.
- 121 *Ocean Ranger* Ballast Tanks Configuration for February 14, 1982.
- 122 Various *Ocean Ranger* Reports, 89 pages
 - Pgs. 1-6, A.M. Reports January 28,29,30, 1982;
 - Pgs. 7-69, Two Hour Logs January 1-31, 1982;
 - Pgs. 70-89, A.M. Back-Up Reports July 12-21, 1981.
- 123 Physical Evidence Recovered from *Ocean Ranger* during July 1982 Dive Survey:
 - 1) Brass Rod & Bolt;
 - 2) Base;
 - 3) Solenoid Valve and Dust Cover.
- 124 List of Condition of Solenoid Valves as retrieved from July, 1982 Dive Survey of the *Ocean Ranger*.
- 125 Hand Drawing of Lower Control Panel Solenoid Banks presented by Counsel for ODECO Drilling of Canada Limited.
- 126 Enhanced Exhibit 74B, Mimic Diagram of Control Face Port Hull and Starboard Hull presented by Commissioner Furst.
- 127 Selected American Bureau of Shipping Documents, 23 pages, reviewed by Mr. John L. Wilson, Principal Surveyor, American Bureau of Shipping.
- 128 Mobil Oil Canada Limited, Correspondence from October 1, 1980 to April 11, 1981 re: Local Hiring Policy.
- 129 Photos (four), Exterior Views of Ballast Control Room, presented by Mr. Garland Elsworth, former Weather Observer, *Ocean Ranger*; identified by Mr. Frank Jennings, former Ballast Control Operator, *Ocean Ranger*.
- 130 Ocean Drilling and Exploration Company: Inter-office correspondence dated July 3, 1978; Subject: Height correction coefficients for wind speed readings.
- 131 Employment Information File, Registry Summary, and General Correspondence from ODECO (U.K.) Inc., and ODECO Drilling of Canada Limited to Department of Labour, Province of Newfoundland and Labrador, October 9, 1980 to April 15, 1981.

- 132** MacLaren-Marex Daily Observations Log for January 9-10, 1982, identified by William Joseph English, Weather Observer with MacLaren.
- 133** Petroleum Extension Service, The University of Texas, "Lessons in Rotary Drilling Unit V, Lesson 1 – Wind, Waves and Weather", 1977.
- 134** Petroleum Extension Service, The University of Texas, "Lessons in Rotary Drilling Unit V, Lesson 2 – Spread Mooring Systems", 1976.
- 135** Petroleum Extension Service, The University of Texas, "Lessons in Rotary Drilling Unit V, Lesson 3 – Buoyancy, Stability and Trim", 1976.
- 136** Notes presented by Bruce Porter, Ballast Control Operator, *Ocean Ranger*.
- 137** Draft Report: National Transportation Safety Board, Marine Accident Report into the Capsizing and Sinking of the U.S. Mobile Offshore Drilling Unit *Ocean Ranger*, dated March 2, 1983.
- 138** Ocean Drilling and Exploration Company Certificate of Training: Bruce Porter, Roustabout.
- 139** Extract from United States Coast Guard Regulations for Mobile Offshore Drilling Units 46 CFR 109.215; 109.217, December 4, 1978.
- 140** Correspondence presented by Karl Nehring, former Master, *Ocean Ranger* entitled:
To: Officer in Charge, Marine Inspection, United States Coast Guard, January 1, 1982.
- 141** Report by Toolpusher Kent Thompson to Ocean Drilling and Exploration Company on the resignation of Captain Karl Nehring.
- 142** Drilling Superintendent's Report on 5° Port Aft List Aboard *Ocean Ranger*, February 6, 1982.
- 143** Anchoring Report Hibernia J-34 November 29, 1981.
- 144** Motion Compensation Systems Diagram.
- 145A** *Ocean Ranger* Morning Reports to ODECO Drilling of Canada Limited, St. John's, December, 1981.
- 145B** *Ocean Ranger* Morning Reports to ODECO Drilling of Canada Limited, St. John's, January, 1982.
- 145C** *Ocean Ranger* Morning Reports to ODECO Drilling of Canada Limited, St. John's, February, 1982.
- 146** Correspondence from W. M. Hannan, American Bureau of Shipping:
1) To G. N. Troxell of Ocean Drilling and Exploration Company, February 18, 1976,
2) To Republica de Panama, February 18, 1976.
- 147** *Ocean Ranger* Model Tests conducted by Offshore Technology Corporation 1974, extract from Exhibit #57, pages 1, 12, 23.
- 148** Summary Table 6 of Stability Reports for the *Ocean Ranger*, October 12, 1981 and October 18, 1981.
- 149** Report to Jim Wilkinson, Vice President of Ocean Drilling and Exploration Company from Jim Counts, Drilling Superintendent, *Ocean Ranger*, in reference to the resignation of Captain Karl Nehring. Presented by Counsel for ODECO.
- 150** Correspondence from Mr. Merv Graham, Drilling Superintendent, Mobil Oil Canada Limited to Mr. Gordon Gosse, Newfoundland and Labrador Petroleum Directorate, February 10, 1982; correspondence from Mr. Graham to ODECO Drilling of Canada Limited, February 12, 1982 re: February 6 List.
- 151** Summary of Phone Calls, Notes and Memory, preceding, during and after the *Ocean Ranger* Event on February 15, 1982, by Merv Graham, Drilling Superintendent, Mobil Oil Canada Limited.
- 152** Correspondence from Messrs. Stirling, Ryan, Reid, Harrington, Andrews and Lilly, June 25, 1982 to L. A. Martin, Commission Counsel re: Hibernia J-34 Well Suspension Program.
- 153** *Ocean Ranger* Drill String as Recorded by the *Neddrill 2*, June 10, 1982, extract from Exhibit 196, Canada Oil and Gas Lands Administration's Report.
- 154A** Transcript, Magnetic Log Recorded at Search and Rescue Emergency Centre, St. John's February 15, 1982, Page 1-200.

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- 154B** Transcript, Magnetic Log Recorded at Search and Rescue Emergency Centre, St. John's February 5, 1982, Page 201-387.
- 155** Memory Jogger Notes of February 13-15, 1982 by Merv Graham, Drilling Superintendent, Mobil Oil Canada Limited.
- 156** Charter Party between Mobil Oil Canada Limited and Seabase Nova Scotia Limited, January 15, 1982, for Services of Supply Vessel *MV Seaforth Highlander*.
- 157** *SEDCO 706* Plan of Upper Deck.
- 158** *SEDCO 706* list of Radio Room Equipment and New Radio Equipment installed since February 14, 1982, issued October 14, 1982.
- 159** Typed Transcript of Exhibit #18, Radio Logs and Weather, *SEDCO 706* February 14, 15, 1982.
- 160** *SEDCO 706* Chart Layout of the Radio Console.
- 161** Extracts from *Zapata Uglund* Radio Logs for February, 1982.
- 162** *Seaforth Highlander* Logs for period February 14-23, 1982, including Official Log, Chief Officer's Log, and Diary of Radio Telephone Service.
- 162A** Typed Transcript of *Seaforth Highlander* Logs for February 14-15, 1982.
- 163** General Arrangement for Anchor Handling Tug/Supply Vessel, *Seaforth Highlander*.
- 164** General Arrangement for T.S. Anchor and Rig Chain Handling Tug/Supply Vessel, *Seaforth Jarl*.
- 165** Letter of Commendation to the *MV Seaforth Highlander* Crew from Mobil Oil Canada Limited, March 30, 1982.
- 166** Extract from Harding Safety Enclosed Lifeboats Brochure.
- 167** Certificate of Vessel Delivery / Redelivery of *MV Seaforth Highlander* from Seaforth Maritime Limited to Mobil Oil Canada Limited, January 15, 1982.
- 167A** Safety Inspection Certificate for *MV Seaforth Highlander* issued by Department of Transport, January 28, 1982.
- 167B** Record of Safety Equipment for *MV Seaforth Highlander* issued by Department of Transport, June 27, 1980.
- 167C** Ship Survey Record for *MV Seaforth Highlander* dated February 18, 1982.
- 168** Handwritten Standing Orders issued by R.S. Duncan, Master and signed by Crew of *MV Seaforth Highlander*.
- 169** Handwritten Standing Orders issued by R.S. Duncan, Master, for Bridge Watchkeeping personnel, *MV Seaforth Highlander*.
- 169A** Typed Transcript of Exhibit 169, Handwritten Standing Orders.
- 170** Sketch: *MV Seaforth Highlander* Course 1200 Hours Local February 14, 1982 to 0105 Hours Local February 15, 1982, presented by R.S. Duncan, Master.
- 171** Sketch: *MV Seaforth Highlander* Position 0105 Hours Local February 15, 1982 presented by R.S. Duncan, Master.
- 172** Sketch: *MV Seaforth Highlander* Position 0150 Hours Local presented by R.S. Duncan, Master.
- 173** List of Publications maintained onboard *MV Seaforth Highlander*.
- 174** Merchant Shipping Notice No. M1019 current December 31, 1981 issued by Department of Trade, London.
- 175** Mobil Oil Canada Limited, St. John's, Communications System with Offshore Rigs, Supply Vessels, Helicopters; Frequencies Listed.
- 176** Notes presented by Mr. Keith Senkoe, Drilling Foreman, *SEDCO 706* for February 14, 1982.
- 177** Sketch: *MV Nordertor* Position 2000 Hours Local February 14, 1982 to 0130 Hours Local February 15, 1982, presented by Baxter Allingham, Master.
- 178** Sketch: *MV Nordertor* Position 0130 Hours Local February 15, 1982 to Arrival on *Ocean Ranger* Location 0340 Hours Local February 15, 1982, presented by Baxter Allingham, Master.

- 179** Correspondence from R.A. Sutherland, United States Coast Guard to Ocean Drilling and Exploration Company, December 18, 1979, re: Inspection for Certificaton of Mobile Offshore Drilling Unit (MODU) *Ocean Ranger*.
- 180** Typed Transcript of Exhibit 180A, Distress Log from R. Fraser, Drilling Foreman, *SEDCO 706*, February 15, 1982.
- 180A** Distress Log from R. Fraser, Drilling Foreman, *SEDCO 706*; (Handwritten Notes), February 15, 1982.
- 181** Well Locations and Positioning of *MV Boltentor* February 15, 1982 presented by James Davison, Master.
- 182** Rig Anchor Buoy and Positioning of *MV Boltentor* February 15, 1982 presented by James Davison, Master.
- 183** *Zapata Uglund* Daily Log for February 14, 1982.
- 184** *Zapata Uglund* Captain's Log for February 14-15, 1982.
- 185** *Zapata Uglund* Daily Log for February 16, 1982.
- 186** Canadian Coast Guard Telex of February 15, 1982 to Search and Rescue Emergency Centre re: All Ships Broadcast.
- 187** Interoffice Correspondence dated February 15-19, 1982 re: *Ocean Ranger* presented by K.F. Beattie, Logistics Supervisor, Mobil Oil Canada Limited.
- 188** Mobil Oil Canada Limited, Correspondence:
- 1) To All Boat Captains from K.F. Beattie, September 10, 1982 ;
 - 2) To All Boat Captains from K.F. Beattie, February 15, 1983;
 - 3) To Neil Blackburn from K.F. Beattie, April 20, 1983;
 - 4) To All Boat Captains, Reporting of Positioning of Standby Vessels Rules from K.F. Beattie, August 31, 1982;
 - 5) To Mobil Radio Operators re Supply Boat Movements from S. Romansky, August 20, 1982.
- 189** Search & Rescue Mission Report on *Ocean Ranger*, February 15, 1982.
- 190** Search & Rescue Emergency Centre, St. John's, Watchkeeper's Notes, February 15 – March 1, 1982.
- 191** Extract from "Nato Operations Flight Manual", of April 1, 1980.
- 192** 103 Rescue Unit Helicopters Average Serviceability Rate by Month.
- 193** Correspondence from 103 Rescue Unit dated July 27, 1982 from Major K.T. Gathercole to Mr. Norm Whalen.
- 194** 103 Rescue Unit Annex A, Standing Operating Procedures, Attachments 1-7 of July 27, 1982, letter.
- 195** 103 Rescue Unit Helicopter Usage January 1977 to May 1982.
- 196** Re-entry and Suspension of Hibernia J-34, July 15, 1982, from Canada Oil and Gas Lands Administration.
- 197** Royal Canadian Mounted Police Exhibit Report entitled Security Systems Section, re: *Ocean Ranger* Disaster dated July 14, 1982.
- 198** Index of Autopsy Reports of Victims of *Ocean Ranger* Disaster submitted by Dr. Eric Pike, Forensic Pathologist, General Hospital, Health Sciences Centre.
- 199** Document submitted by Dr. Eric Pike regarding Changes in Human Body with Falling Body Temperatures.
- 200** List of Crew Members Recovered by Date, Time and Location compiled from Royal Canadian Mounted Police information.
- 201** Rescue Co-ordination Centre (RCC) Halifax, Watchkeeper's Log for February 15-25, 1982.
- 202** Search and Rescue Special Report (SAR) *Ocean Ranger* February 15, 1982.
- 203** Addendum to Search and Rescue Special Report.
- 204** Summary report of Investigation into circumstances attending the foundering of the Russian Vessel *Mekhanik Tarasov* in the North Atlantic on February 16, 1982, issued by Canadian Coast Guard, Marine Casualty Investigations, June 1982.
- 205** Map of East Coast of Canada with co-ordinates of 65°.45° Latitude and Longitude Boundaries identifying ship locations in response to distress messages.

- 206 Identification of Search Area on February 15, 1982, plotted on Canadian Hydrographic Chart #8012 by Search & Rescue.
- 207 Identification of Search Area on February 16, 1982, plotted on Canadian Hydrographic Chart #8012 by Search & Rescue.
- 208 Identification of Search Area on February 17, 1982, plotted on Canadian Hydrographic Chart #8012 by Search & Rescue.
- 209 Identification of Search Area on February 18-19, 1982, plotted on Canadian Hydrographic Chart #8012 by Search & Rescue.
- 210 Identification of Search Area on February 20-21, 1982, plotted on Canadian Hydrographic Chart #8012 by Search & Rescue.
- 211 Identification of Items Recovered, Date and Area plotted on Canadian Hydrographic Chart #8012 by Search & Rescue.
- 212 Eight Photographs of *Mekhanik Tarasov* Rescue Mission presented by B. Leonard, Canadian Coast Guard Rescue Officer.
- 213 "Search and Rescue Order and Procedures", on authority of the Chief of Defence Staff, National Defence, February, 1976 (One copy held by Registrar).
- 214 Correspondence from the Director of Interdepartmental Committee on Search & Rescue (ICSAR) dated March 8, 1983 to Members re: Major Marine Disaster Plan.
- 215 Audio and Video Tape Index representing 32 hours of actual tape taken during the *Ocean Ranger* Dive Survey conducted by Hydrospace Marine Services July 14 – August 1, 1982.
- 216 Listing of Lower Hull Tank Soundings taken during the Dive Survey July 14 – August 1, 1982.
- 217 Hydrospace Marine Services Dive Log maintained by Max Ruelokke, Vice President and General Manager, July 14 – August 1, 1982.
- 218 Hydrospace Marine Services Divers' Log July 14 – August 1, 1982.
- 219 Copy of Side Scan Sonar Survey of March 8, 1982, Figure 4, prepared for Mobil Oil Canada Limited by McElhanney Surveying and Engineering.
- 220 "Engineering Reports A to G", prepared by Aviation Safety Engineering Facility, Aviation Safety Bureau, Transport Canada. Completed September 8, 1983:
 - Report A – EP 266/82 – Portholes Examination
 - Report B – EP 90/83 – Porthole Glass Pressure Tests
 - Report C – EP 265/82 – Analysis of Solenoid Control Valves
 - Report D – EP 331/83 – Ballast Control Mimic Panel Analysis
 - Report E – EP 332/83 – Ballast Control Panel Light Bulb Analysis
 - Report F – EP 333/83 – Ballast Control Panel Tests
 - Report G – EP 195/82 – Ballast Control Electrical System & Overall Analysis
- 221 "Analysis of Lifesaving Equipment Performance", submitted by R.L. Markle, Acting Chief, Survival Systems Branch, Merchant Vessel Inspections Division, United States Coast Guard, November 29, 1982.
- 222 Billy Pugh Personal Flotation Device, sample of Lot 1A recovered from search area.
- 223 Japanese Industrial Standard, Tempered Glasses for Ships' Side Scuttles, F2410 – 1955 obtained from American Bureau of Shipping.
- 224 Technitrol Canada Limited Report on Lifesaving Equipment, September 9, 1983.
- 225 Portion of Recovered *Ocean Ranger* Liferaft #715 Showing Blisters.
- 226 Portion of Recovered *Ocean Ranger* Liferaft #715 Seam Width.
- 227 Portion of Recovered *Ocean Ranger* Liferaft #715 Seam Width.
- 228 Portion of Recovered *Ocean Ranger* Liferaft #715 Seam Width.
- 229 15mm wide rescue lines from recovered liferaft.
- 230 Sample inflatable raft material showing seam width.

- 231** Seat belt from recovered Harding lifeboat.
- 232** Portion of recovered Harding lifeboat hull.
- 233** Portion of recovered Watercraft hull.
- 234** Portion of woven fibreglass from recovered Harding lifeboat.
- 235** Portion of chop fibreglass from recovered Watercraft lifeboat.
- 236** Video Tape Index for Ballast Control Panel Testing conducted by Aviation Safety Engineering and the Royal Commission and Index of Slides received from Aviation Safety Engineering.
- 237A** Government of Newfoundland & Labrador Petroleum Directorate's "Technical Investigation of *Ocean Ranger* Accident", Volume 1, April, 1983.
- 237B** Government of Newfoundland & Labrador Petroleum Directorate's "Technical Investigation of *Ocean Ranger* Accident", Volume 2, Appendices, April, 1983.
- 238** Report of The Robert Gordon Institute of Technology Offshore Survival Centre, Aberdeen, Scotland.
- 239** Report on "Offshore Installation Support by Standby/Rescue Ships", submitted by Hamish McDonald, Manager, Maritime Rescue Section of The Robert Gordon Institute of Technology.
- 240** *MV Seaforth Highlander* Log and M. MacLeod's Statement re: Smashed Porthole Incident, February 9, 1980.
- 241** *MV Seaforth Highlander* Engine Room Log for February 14-15, 1982.
- 242** Memory Jogger Notes presented by Peter Kapral, Drilling Foreman, Mobil Oil Canada Limited for February 13-14, 1982.
- 243** Additional Notes from Peter Kapral noted as Kapral #2.
- 244** Resume of Brinley Davies, Chief, Communications & Computer Engineering Division, Canadian Coast Guard, Transport Canada.
- 245** Map depicting Areas of Radio Coverage, VHF and MF, East Coast of Canada submitted by Brinley Davies.
- 246** Hand Drawn Document of Transmitter and Receiver Antenna Coupler submitted by Brinley Davies.
- 247** Comparative Communications Range of 2182 KHZ Ground Wave Signal as a Function of Transmitter Output Power submitted by Brinley Davies.
- 248** Map depicting the location of *Zapata Uglad*, *SEDCO 706* and *Ocean Ranger* in relation to the Avalon Peninsula.
- 249** Map depicting INMARSAT 800 MHZ Coverage Capability.
- 250** Report entitled "The Stand-by Boat Service on the Continental Shelf", prepared for the Norwegian Petroleum Directorate, December 1982.
- 251** Certificates of Training (2), Joseph Wayne Berthier, Former Safety Engineer, *Ocean Ranger*.
- 252** Extract from Ocean Drilling & Exploration Company's Industrial Relations Safety Manual.
- 253** Detail Air Inlet, revised work plan submitted to Canada Oil and Gas Lands Administration by Nan Halfweg of Wijsmuller Salvage B.V.
- 254** Flotation Cylinder, revised work plan submitted to Canada Oil and Gas Lands Administration by Nan Halfweg of Wijsmuller Salvage B.V.
- 255** Diary of Events for February 15-24, 1982 by John Greer, Director, Emergency Measures, Province of Newfoundland & Labrador.
- 256** The ODECO *Ocean Ranger* Accident Report of Province of Newfoundland Contingency Response, February 15, 1982.
- 257** *Ocean Ranger* Ballast System Analysis, prepared for George A. Frilot III, Attorney for ODECO Drilling of Canada Limited, February 10, 1984 by Ralph W. Loomis, Manager of Engineering for Domestic Operations.

- 258A** *Ocean Ranger* Contract Specifications, Volume 1 dated November 1, 1973.
- 258B** *Ocean Ranger* Contract Specifications, Volume 2.
- 259** Ocean Drilling & Exploration Company Personnel File – Captain Clarence Hauss, Master of the *Ocean Ranger*, February 14, 1982.
- 260** Ocean Drilling & Exploration Company Personnel File – Captain Karl Nehring, former Master of the *Ocean Ranger*.
- 261** Ocean Drilling & Exploration Company Personnel File – Don Rathbun, Ballast Control Room Operator, *Ocean Ranger*, February 14, 1982.
- 262** Ocean Drilling & Exploration Company Personnel File – Clifford Himes, Ballast Control Room Operator, *Ocean Ranger*.
- 263** Ocean Drilling & Exploration Company Personnel File – Dominic Dyke, Ballast Control Room Operator, *Ocean Ranger*, February 14, 1982.
- 264** Ocean Drilling & Exploration Company Employment History of Key Crew Members, Donald Rathbun, Domenic Dyke, Thomas Donlon, Benjamin Thompson, Clarence Hauss, Paul Bursey and George Gandy.
- 265** Extract from Ocean Drilling & Exploration Company's Personnel Files – Personal Data of Key Drilling Crew Members, Donald Leger and Jimmy Counts.
- 266** Extract from Ocean Drilling & Exploration Company's Personnel Files – Personal Data of Marine Crew Members, Bruce Porter, Geoffrey Dilks, Ronald Hoar, Clifford Himes, Karl Nehring and Frank Jennings.
- 267** Layne & Bowler Pump Co. Drawing No. 464-00988 -*Ocean Ranger* Ballast Pumps.
- 268** Ocean Drilling & Exploration Company Correspondence of October 22, 1982 to Lieutenant Commander Richard Ford, United States Coast Guard, re: Duties of Rig Safety Personnel.
- 269** John T. Ward, Attorney, Ober, Grimes & Shriver, Correspondence of March 1, 1983 to David Orsborn, Associate Commission Counsel, re: Estate of Clarence E. Hauss, Master, *Ocean Ranger*.
- 270** ODECO Drilling of Canada Limited Statement of Claim in the Federal Court of Canada, Court No. T-436-83, Filed February 11, 1983.
- 271** "Ocean Ranger Chain Locker Flooding in Severe Waves", Report prepared by Young S. Hong and Alvin Gersten of The David W. Taylor Naval Ship Research & Development Center, January 1983 for United States Coast Guard.
- 272** "Ocean Ranger Ballast Pump Analysis", prepared by Edmund J. Jarski of The David W. Taylor Naval Ship Research & Development Center for United States Coast Guard.
- 273** United States Coast Guard "Marine Casualty Report into the Capsizing and Sinking of the Mobile Offshore Drilling Unit (MODU) *Ocean Ranger*", on February 15, 1982, Report No. 001 HQS 82, May 20, 1983.
- 274** ODECO Purchase Order No. 2962-28-20777 to Pump Systems, for *Ocean Ranger* Pump Parts dated January 29, 1974.
- 275** ODECO Purchase Order No. 4198-28-21477 to Byron Jackson Pump Division for *Ocean Ranger* Pump Parts dated April 3, 1974.
- 276** Extract from Indianapolis Parts List re: Solenoid Valve and Manual Devices available in 1974.
- 277** Ocean Drilling & Exploration Company Interoffice Correspondence to Tucker H. Couvillon from Training Department, February 20, 1984.
- 278** Wave Calculations by Dr. Terry Petty, President of ODECO Engineers Inc.
- 279** "Engineering Report H – EP 72/84 – Pump Switch Failure Demonstration", prepared by Aviation Safety Engineering Facility, Aviation Safety Bureau, Transport Canada, March 1, 1984.
- 280** "Engineering Report I – EP 73/84 – Microswitch Failure Analysis", prepared by Aviation Safety Engineering Facility, Aviation Safety Bureau, Transport Canada, March 1, 1984.

- 281** Report #1 – “Diving Operations during July/August 1982 and comments derived from Mobil RCV Survey Tapes – March 1982”, dated October 1983.
- 282** Report #2 – “Hydrostatics and Statical Stability including Loading Conditions Pre and Post Postulated Valve/Ballast Tank Runaway”, dated September 1983.
- 282A** Amendment to Section 5 of Burness, Corlett & Partners Report No. 2.
- 283** Report #3 – “Technical Appraisal of some Features Including Ballast System and Its Control”, dated October 1983.
- 283.1** Replacement for Section 5 and Appendix 5 of Report No. 3, Final Calculations on the Ballast Pumping System Capability of the *Ocean Ranger*.
- 284A** Report #4 – Volume 1 – “Model Test Programmes at National Research Council Laboratories, Ottawa and Norwegian Hydrodynamic Laboratories, Trondheim”, dated December 1983.
- 284B** Report #4 – Volume 2 – Appendices, dated December 1983.
- 285** Report #5 – “Analysis of Events – Cessation of Drilling Operations to Capsize February 14th-15th 1982”, dated January 1984.

OCEAN RANGER MODEL TEST REPORTS CONDUCTED BY NORWEGIAN HYDRODYNAMIC LABORATORIES, TRONDHEIM, NORWAY, FOR THE ROYAL COMMISSION, EXHIBIT NOS. 286-291:

- 286** Report #1 – “Test Set-Up”, dated September 1983.
- 287** Report #2 – “Calibration Results”, dated September 1983.
- 288** Report #3 – “Test Results” Volume 1, dated September 1983.
- 289** Report #3 – “Test Results” Volume 2, dated September 1983.
- 290** Report #4 – “Main Report”, dated September 1983.
- 291** – “Video Recordings”, dated September 1983.

OCEAN RANGER MODEL TEST REPORTS CONDUCTED BY THE NATIONAL RESEARCH COUNCIL OF CANADA, OTTAWA, CANADA FOR THE ROYAL COMMISSION, EXHIBIT NOS. 292-297:

- 292** #LTR-SH-355 – “The *Ocean Ranger* Project The Design of the Hydrodynamic Model”, prepared by the Arctic Vessel and Marine Research Institute Division of National Research Council, dated July 1983.
- 293** #LTR-LA-264 – “Wind Forces on the *Ocean Ranger* Off-Shore Drilling Platform”, prepared by the National Aeronautical Establishment Division of National Research Council, dated October 31, 1983.
- 294** #CTR-HY-001 – “An Hydrodynamic Model Study of the Mobile Offshore Drilling Unit *Ocean Ranger*”, Volume I, prepared by the Division of Mechanical Engineering of National Research Council, dated February 1984.
- 295** #CTR-HY-001 – Volume II, Appendices A & B – An Hydrodynamic Model Study of the Mobile Offshore Drilling Unit *Ocean Ranger*.
- 296** #CTR-HY-001 – Volume III, Appendix B (Cont'd) – An Hydrodynamic Model Study of the Mobile Offshore Drilling Unit *Ocean Ranger*.
- 297** #CTR-HY-001 – Volume IV, Appendix B (Cont'd) – An Hydrodynamic Model Study of the Mobile Offshore Drilling Unit *Ocean Ranger*.
- 298** “Report on Ballast Control System Failure on the *Diamond M. Epoch* Semi-Submersible Drilling Rig”, March 19, 1983.
- 299** Canada Oil and Gas Lands Administration Drilling Unit Inspection Check List.
- 300** Fairleads With/Without Cables, Video Tape References from Mobil Oil Canada Limited, Royal Commission and Wijsmuller Salvage Dives prepared by Dr. Ewan Christian Brew Corlett.
- 301** Statement of Qualifications, Ewan Christian Brew Corlett, Chairman & Managing Director of Burness, Corlett & Partners Limited.

- 302** Errata issued for Burness, Corlett & Partners Report No. 2, Exhibit No. 282.
- 303** Errata issued for Burness, Corlett & Partners Report No. 1, Exhibit No. 281.
- 304** "BS MA 24: British Standard Marine Series Specifications for Ships' Side Scuttles", dated October 1974.
- 305** Data Analysis from Current Meter Moorings at *SEDCO 706*, *Ocean Ranger*, and *Zapata Uglund* on the Grand Banks. Report No. 17 prepared by MacLaren Plansearch for Mobil Oil Canada Limited, March 1982.
- 306** Consulting Agreement between Mobil Oil Canada Limited and NORDCO Limited effective January 1, 1982.
- 307** Consulting Agreement between Mobil Oil Canada Limited and Fenco Newfoundland Limited effective January 1, 1982.
- 308** Agreement between Mobil Oil Canada Limited and Hydrospace Marine Services Limited effective April 8, 1981.
- 309** Agreement between Mobil Oil Canada Limited and Porta Test Systems Limited effective November 1, 1981.
- 310** Agreement between Mobil Oil Canada Limited and Easteel Industries Limited effective August 13, 1981.
- 311** Agreement between Mobil Oil Canada Limited and Schlumberger Canada Limited, The Analysts of Canada Division, effective November 1, 1980.
- 312** Agreement between Mobil Oil Canada Limited and Schlumberger of Canada Limited, Wire Line Logging Operations Division, effective November 1, 1980.
- 313** Search & Rescue *Ocean Ranger*, Taped Transcripts of Voice Communications of Rescue Co-ordination Centre, Halifax for February 15, 1982, 050209Z – 180138Z (0132.09 – 1431.38 NST).
- 314** Transport Canada Ship Safety Branch Report on "Interim Standards Respecting Mobile Offshore Drilling Units", 1984.
- 315** Canada Oil and Gas Lands Administration, News Release, Revised Safety Guidelines issued for East Coast Drilling, December 8, 1983.
- 316** Memorandum of Understanding between the Canadian Coast Guard and Canada Oil and Gas Lands Administration regarding the Provision of Marine Services to the Offshore Areas of Petroleum Development, July 22, 1982.
- 317** Correspondence dated May 25, 1983 to Mr. Arthur Kroeger, Deputy Minister, Transport Canada from Paul M. Tellier, Energy, Mines & Resources.
- 318** Memorandum of Understanding concerning the Establishment of Canada Oil & Gas Lands Administration between the Ministers of Energy, Mines and Resources and of Indian and Northern Affairs.
- 319** Telex dated February 14, 1984 to Dr. E.C.B. Corlett from E.H. Dudgeon of National Research Council re: Trimming Tests.
- 320** Foreword to International Standard ISO 1751.
- 321** Letter dated September 21, 1983 to Mr. A. Halcrow of Canada Oil and Gas Lands Administration from F. Mumcuoglu, of Mobil Oil Canada Limited, Subject: Re-entry and Testing Program Approval Mobil et al Hibernia J-34.

STATISTICS TO MARCH 22, 1984

- No. of days of Hearings: 89
- No. of witnesses heard: 102
- Pages of transcript: 14,281
- No. of exhibits entered: 321

Item A-10

Royal Commission on the
Ocean Ranger Marine Disaster

Canada



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

Newfoundland/Terre-Neuve

NOTICE

Part One of the Commission's mandate establishes the Terms of Reference for the inquiry into the loss of the *Ocean Ranger*. The technical evidence arising from this investigation will be heard during the final phase of the public hearings that will resume in the fall.

Part Two instructs the Commission to inquire into "both the marine and drilling aspects of practices and procedures in respect of offshore drilling operations" off Eastern Canada. This inquiry, which is proceeding in parallel with the Part One investigation, will draw on three main sources of information: evidence given regarding the loss of the *Ocean Ranger*; the results of studies that are being undertaken for the Commission; and briefs or submissions presented to the Commission.

The Commission has set as its goal: to identify practical means of improving the safety of Eastern Canada offshore drilling operations. The studies directed towards this goal are being approached under four principal areas;

- Environment — evaluation of design and operations criteria dictated by the physical environment offshore;
- Design — the conception, design, construction, classification, certification and equipping of drilling units used in offshore operations;
- Safety — the elements of offshore drilling operations related to human safety including all aspects of safety of life at sea including rescue, occupational health and the certification and training of the marine and drilling crews;
- Regulation — the manner in which offshore drilling operations are controlled by rules, regulations and guidelines and their adequacy in relationship to safety.

The Commission invites knowledgeable people and organizations to make submissions addressed to this goal. Anyone wishing to make such a contribution to the Commission's work should do so in writing by December 31, 1983. Submissions should be sent to:

David M. Grenville
Commission Secretary
Royal Commission on the *Ocean Ranger* Marine Disaster
P. O. Box 2400
St. John's, Newfoundland
A1C 6G3

from whom further information about the form and scope of submissions can also be obtained.

Public hearings related to Part Two of the Commission's Terms of Reference will be held at a place and time to be announced.

Item A-11
Royal Commission Staff

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INDUSTRY BACKGROUND

APPENDIX B

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APPENDIX B

INDUSTRY BACKGROUND

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Item B-1

A Brief History of Offshore Drilling

The petroleum industry as we know it today is often depicted as a monolithic giant affecting every aspect of the global economic system. Though the petroleum industry has expanded its operating base to include both industrial and consumer product manufacturing and distribution, the primary source of its raw materials comes from the exploration and production of oil and gas reserves, both on land and offshore. The petroleum industry began in the nineteenth century with the discovery of substantial hydrocarbon deposits, primarily in North America. The increased economic need for petroleum, coupled with easily accessible reserves, provided the industry's pioneers with the stimuli they required to locate and exploit petroleum resources and to develop increasingly efficient drilling technology. Around 1900, these same motives induced expansion into exploratory drilling over water, and by the early 1950s offshore exploration and production had become an industry in its own right, with its own experts, service companies, and equipment to cope with the unique problems of drilling over water. The development of today's sophisticated offshore technology was a gradual process, evolving over the last 80 years.

The first recorded offshore drilling venture took place in the late 19th century near Santa Barbara, California, where the presence of oil had long been recognized. In the 1860s, natural asphalt seepages were extracted from the beaches and prospectors eventually discovered that oil bearing formations extended underneath the ocean. In 1897 the first "over water" exploration wells were drilled from wooden stages which extended from the shoreline, and by 1900, beaches in the Summerland, California area displayed clusters of wharves up to 1200 feet in length, from which exploration wells were successfully drilled.

Oil and gas seepages, similar to those found on the California coastline, were prevalent in the Caddo Lake area of north-eastern Texas and northwestern Louisiana, where in 1870 a well aimed at locating water encountered natural gas. This accidental discovery caused numerous technical problems associated with well control. Blowouts were frequent in early gas wells and in some instances uncontrolled wells burned for

years. As a result of the Caddo Lake experience, government enacted well-control regulations and, through lease sales, limited the development of land surrounding and beneath the lake. To conduct drilling operations over water, equipment was transported by barge to the drill site where a drilling platform and pipe rack, like those used on land sites, were constructed. Wooden pilings were driven to provide a fixed base for the drilling equipment. In 1911, Gulf Oil Limited produced the first oil from an inland lake using this type of drilling system. Platform design and production techniques pioneered by Gulf in Caddo Lake became an acceptable standard in the industry and were used to produce oil in Lake Maracaibo, Venezuela in the early 1920s. Derrick foundations progressed from wood to concrete, and by the 1930s steel became the standard.

Geophysical and seismic exploration along the coastlines of Texas and Louisiana produced numerous prospects, but the open bays, lakes, swamps and marshes of the area presented unique problems and required a totally different approach. Because of the silty subsoil of the Gulf Coast, Texaco Inc. commissioned the construction of a submersible barge equipped with a derrick and drilling equipment for exploration on inland waterways and lakes. The barge could be floated to a drilling site, flooded and submerged to rest on the shallow bottom which provided a solid support for drilling. This innovative concept eliminated the costs of constructing fixed platforms because the barge could be refloated and moved to another site when drilling was completed. The first submersible barge, consisted of two barge hulls each with several watertight compartments, was designed to operate in ten feet of water. A distribution manifold with seacocks adjusted the flow of water during submerging. A steel superstructure supported the derrick, drilling machinery, pipe racks, and ancillary equipment such as mud tanks and pumps. Submersible barges provided an efficient and economical method for exploration of inland waterways.

As exploration in the Gulf of Mexico expanded in the 1930s, offshore exploration was still restricted to drilling from fixed platforms. In 1947 Kerr McGee Oil Industries pioneered an innovative platform design, which was considerably smaller than those previously used in the Gulf of Mexico. The derrick and basic drilling machinery were

located on a small fixed platform, with ancillary equipment, consumables and crew's quarters located on a floating tender. Since the platform and tender were located 10.5 miles offshore, they had to withstand local wind and wave forces. This design proved quite effective but the mooring system was not always capable of keeping the tender on location during poor weather conditions.

The oil industry responded favourably to Kerr McGee's innovative concept, which subsequently inspired the design of floating structures for the entire drilling operation. In 1948, John Hayward designed a drilling platform combining the submersible barge and pile support concept. The barge hull could be floated to location, then submerged to rest on the bottom, providing the platform with the necessary support, freeboard and stability. Hayward's design incorporated two pontoons which could be ballasted or deballasted independently. By 1949, the industry's first mobile drilling platform was launched and operated on several locations in 18 foot water depths. In 1954 the Ocean Drilling and Exploration Company (ODECO) built a floating barge based on Hayward's concept, to operate in water depths up to 40 feet. Operators began to commission similar designs for deeper water depths, adding buoyant vertical columns at each corner of the platform in order to achieve better performance.

As activity in the Gulf of Mexico increased, other areas of the United States, principally the California coast, became interested in exploratory drilling. Here public pressures discouraged the use of fixed platforms and the industry was forced to examine alternate designs. The result was an experimental program in 1953, involving a converted navy vessel used to develop a ship-based floating drilling system. A cantilevered drilling platform was extended from the vessel amidship, and the experiment allowed designers to identify equipment and system improvements, particularly in counteracting the vertical motion of the ship (heave) and its effect on the drilling operation.

In 1956, the first purpose-built drill ship was completed. The drilling platform and derrick were located amidship over an opening in the hull called the "moonpool". The motion characteristics of the drill ship were improved substantially as more were designed, and improvements to the industrial and marine systems evolved rapidly. A slip joint to compensate for heave was developed, improved mooring systems were

designed, and a subsea system was designed to position the wellhead on the ocean floor. The design of the slipjoint and heave compensation systems permitted drilling to continue in moderate seas and allowed the operator to suspend operations during storms.

The industry continued to design and improve drilling units that were stable, mobile and cost effective. Their research led to the evolution of truly mobile (self-propelled) floating drilling units, and through the 1960s the drilling fleet expanded in size and type. Four generic forms of mobile drilling units evolved from the design innovations tested in the 1940s and 1950s. Two of these were bottom supported; submersibles and self-elevating platforms. The other two were freefloating; drill ships and semisubmersibles.

Submersibles generally have an upper hull for drilling equipment and crew's quarters, and a lower hull for flotation while in transit and bottom support while in the drilling mode. The rig is usually towed to the drill site where its lower hulls are flooded until they rest on the sea floor. In this position, the submersible is a relatively stable drilling platform. Once the drilling is completed, ballast water is pumped out of the lower hulls and the submersible is refloated. Because the submersible is designed as a bottom supported drilling unit, its operation is limited to water depths of up to 150 feet. Given the increasing requirement for exploration in deeper waters, the submersible fleet has seen limited growth since the 1960s.

The self-elevating or "jack-up" rig is the most widely used platform employed by today's offshore drilling industry. The basic design first appeared in the 1950s. The jack-up has a large hull fitted with a number of retractable legs. The platform can be towed or self-propelled to a drill site with its legs drawn up above the deck. Once on location, the legs are lowered until they make contact with the seabed. The deck, supported by the legs resting on the sea floor, is then jacked up above the water until a sufficient air gap is created to permit drilling operations unhindered by wave action.

While jack-ups provide a stable drilling platform while on location, they are extremely unstable during towing and jacking operations and can only be used where the seabed provides a solid foundation for the legs. As with the submersible, jack-up rigs are restricted by water depth. Current

designs can accommodate depths in the order of 350 feet.

The drill ship received more recognition after successful experimental programs in California in the late 1950s. The ship-shaped design permits a large deckload requiring less frequent resupply. The benefits of self-propulsion and superior seaworthiness allow drill ships to operate in deep water, with the assistance of either conventional mooring or dynamic positioning systems. However, because of the hull shape and its large surface area, drill ships tend to have poor motion response, particularly to heave. Since the efficiency of an offshore drilling program is contingent upon platform stability, the drill ship tends to be restricted to use in regions having small wave heights and low wind velocities. In Canadian waters drill ships are used on a seasonal basis in the Beaufort and Labrador Seas.

The semisubmersible evolved from the submersible drilling unit and was introduced in the early 1960s. It had been found that the submersible exhibited satisfactory stability characteristics during all stages of ballasting operations and, with certain structural changes, a submersible drilling unit could be designed to be partially submerged, providing a floating platform with good stability. As the industry began to explore deeper waters and harsher physical environments, the use of semisubmersibles became increasingly necessary. The structural arrangement of the semisubmersible consists of a deck, supported by a number of vertical columns, cross braces and pontoons which have sufficient buoyancy to float the entire structure. This arrangement makes the semisubmersible very stable and reduces the effects of wave action since much of the vessel is below the surface of the sea while drilling. The pontoons of the semisubmersible are designed for storing bulk liquids, such as fuel oil, drill water and salt water for ballast. When the semisubmersible moves into the drilling mode it is ballasted down by taking sea water into its ballast tanks. When drilling, the deckload changes continuously as supplies are consumed, and the rig takes on or pumps out ballast water to maintain its draft, trim and stability.

Since its introduction in the early 1960s, a wide variety of semisubmersible designs have evolved. Many of the early units were designed to operate in both the free floating and bottom supported condition (i.e. semisubmersible or submersible), and the drill

floor and derrick were located at either the edge of, or overhanging, the deck structure. The *SEDCO 135* or "arrowhead" design is typical of the first generation of semisubmersibles.

In the 1970s, semisubmersible designs began incorporating improvements resulting from earlier experience in the Gulf of Mexico and the North Sea. The deck was made rectangular to increase deckload, and the drill floor was placed close to the centre of buoyancy, thereby reducing motion effects. Improvements were also made in the mooring systems and several rigs were fitted with either partially or totally dynamic positioning systems.

The semisubmersibles of the 1980s have more standardized structural designs which reduce construction costs; however, the basic principles of stability, mobility and reduced motion characteristics, upon which the first generation of semisubmersibles was designed, still apply.

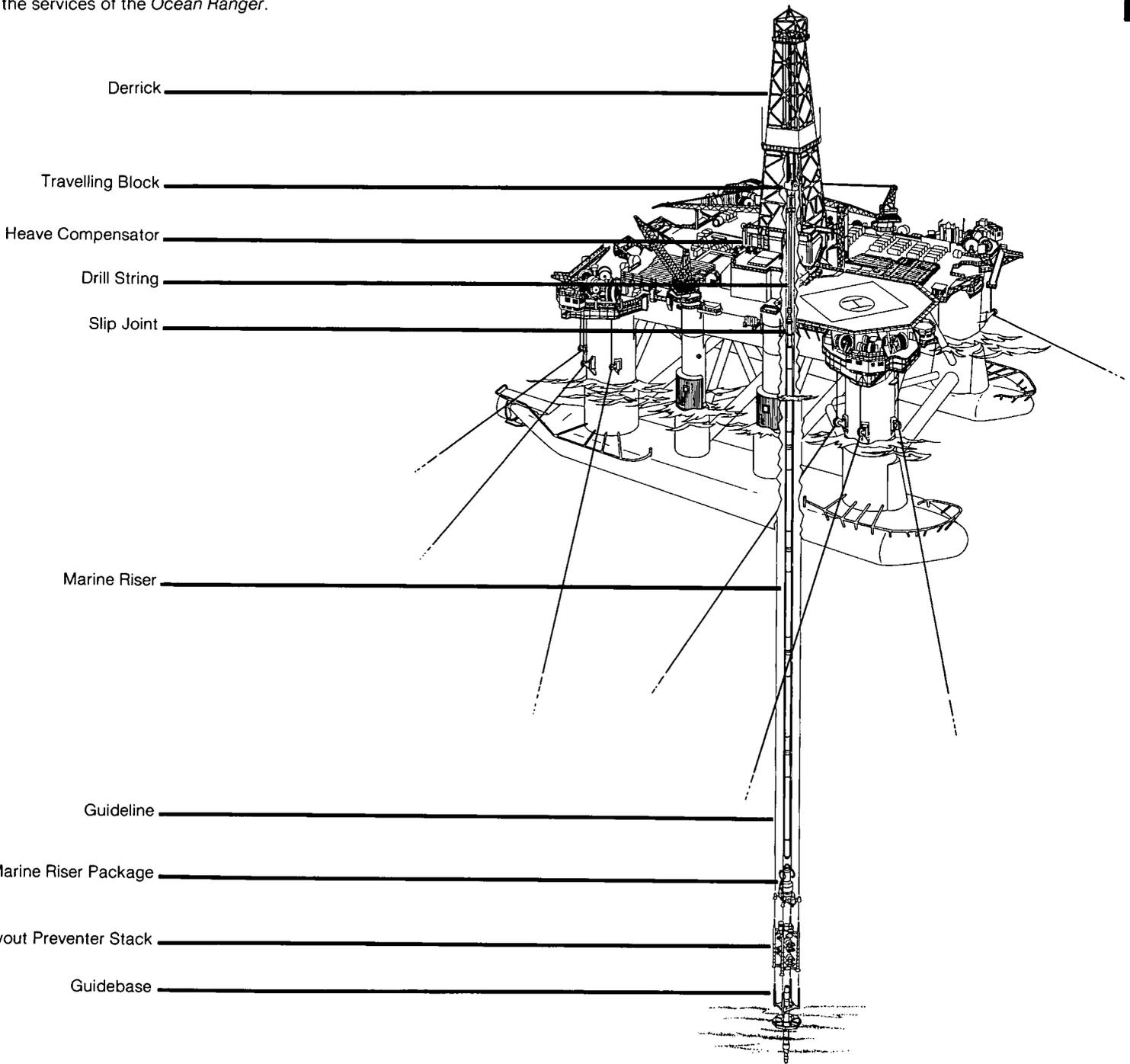
The evolution of mobile offshore drilling units allowed exploration off the east coast of Canada with the use of drill ships, jack-ups and, particularly, semisubmersibles. Oil and gas exploration on Canada's Continental Shelf began in 1960 when geophysical and seismic surveys were undertaken to locate potential hydrocarbon reserves. The first exploratory well was the Pan Am Tors Cove which was drilled on the Grand Banks in 1966.

The pace of exploration continued as major oil companies (operators) including AMOCO, British Petroleum, Texaco, Esso and Mobil conducted exploratory drilling on the Grand Banks, on the Scotian Shelf and in the Labrador Sea. In 1979, a consortium made up of Gulf Canada Ltd., Mobil Oil Canada Ltd., Chevron Canada Ltd. and Columbia Oil and Gas, which had been granted exploration permits by the Federal Government of Canada and the Provincial Government of Newfoundland and Labrador, announced a major oil discovery. The discovery of the Hibernia field, which is estimated to contain 1.8 billion barrels of oil, was the largest discovery in Canada.

To determine the exact size of Hibernia's reservoir, the consortium developed an extensive exploratory drilling program. Since Mobil Oil Canada Ltd. (Mobil), a subsidiary of Mobil Corporation, had considerable offshore drilling experience in the North Sea, its partners designated it as the operator for

the consortium. To undertake its exploratory drilling program, Mobil set up an office and shore base facilities in St. John's, Newfoundland, the major centre closest to the Grand Banks.

As operator, Mobil required a number of semisubmersible drilling units and therefore engaged the services of several major drilling contractors. In February, 1980, Mobil negotiated a contract with Ocean Drilling and Exploration Company Ltd. (ODECO) for the services of the *Ocean Ranger*.



Item B-2

The Industrial System for Offshore Drilling

The basic equipment used in drilling wells and the layout of the industrial system are essentially the same for offshore as for onshore drilling operations. A rotary rig has four major systems; they are the power, hoisting, rotating and circulating systems.

POWER SYSTEM

Most power systems on drill rigs are diesel-electric. A series of diesel engines coupled to generators produces the electric power for the rig's drive motors.

HOISTING SYSTEM

A rig's hoisting system supports the drill string and lowers it into or pulls it out of the well. It is also used to lower casing into the well and to lower into place or bring up wellhead and other equipment. The hoisting system is comprised of the drawworks, the derrick, the crown block, the travelling block and wire rope.

The *drawworks* consists of a large revolving drum around which wire rope is spooled. It contains a main drive and a braking system which allow the drum to turn at variable speeds in either direction and control the heavy loads attached to the hoisting system.

The *wire rope*, spooled on the drawworks, runs to the top of the *derrick*, over a large multiple pulley system called the *crown block*. It then runs back down the derrick, through another multiple pulley called the *travelling block*, back up over the crown block, down again to the travelling block and so on, depending upon the number of lines which have to be threaded. The drill string (drill pipe, drill collars and drilling bit) or any equipment which is to be raised or lowered, is suspended from the travelling block.

ROTATING SYSTEM

The rotating system is designed to rotate the drill bit in the well. It consists of the swivel, the kelly and kelly bushing, the rotary table and the drill string.

The *swivel*, fastened to a hook on the bottom of the travelling block is designed to support the weight of the *drill string*. While allowing the drill string to rotate, the swivel also provides a passageway for drilling mud pumped into and down the drill string.

Suspended immediately below the swivel is a square or hexagonal piece of pipe called the *kelly*. The kelly fits into a corresponding square or hexagonal opening in the *kelly bushing*, which in turn fits into the *rotary table*. The drill pipe is attached to the kelly and suspended from it.

The rotating motion required to turn the drill string and bit is transferred from the rotary table to the kelly bushing and then through the kelly to the drill string.

CIRCULATION SYSTEM

Drilling fluid, or *mud*, the principal component of the circulation system, is used to remove and bring to the surface the cuttings made by the drill bit at the bottom of the well, and to control underground pressures that are encountered as the drill penetrates certain geological formations. Mud is a mixture of fresh water, clay, chemicals and weighting material, transferred under pressure from the mud tanks to a flexible hose, called the *kelly hose*, which is connected to the swivel. The drilling fluid is pumped through the swivel down the kelly and the drill pipe, exiting at the bottom of the well through the drill bit. Since the drilling fluid is under pressure, it returns to the surface along the outside of the drill pipe, coating the inside of the well and sealing off the surrounding formations. The drill cuttings are removed at the surface, and the mud is then recycled down the well.

The density of the drilling fluid must be sufficient to counteract the pressures of gases or fluids contained in the formations which could cause a loss of well control and result in a *blowout*. If the density is insufficient to contain these pressures then control of the well can be maintained through the use of the *blowout preventers*. These are high pressure valves at the wellhead on the sea floor which, when activated by an operator on the rig, form a pressure-tight seal around the drill string at the top of the well, thus preventing the escape of gases or fluids.

DRILLING A WELL

Once the location of a well has been decided through seismic surveys and geological analysis, a rig is moved to the well site and drilling begins with "spudding in". A large diameter drill bit is affixed to the drill string and an initial section of the well is drilled. Additional sections of drill pipe (usually 30 feet in length) are added to the drill string until the well reaches a predetermined

initial depth. Upon reaching this depth, the drill string and drill bit are pulled out of the hole and replaced by a string of large diameter pipe called *casing*. This casing is placed into the well in the same manner as the drill string; however, cement is pumped around the casing between it and the wall of the hole to hold it in place and to seal off the formations which have been drilled.

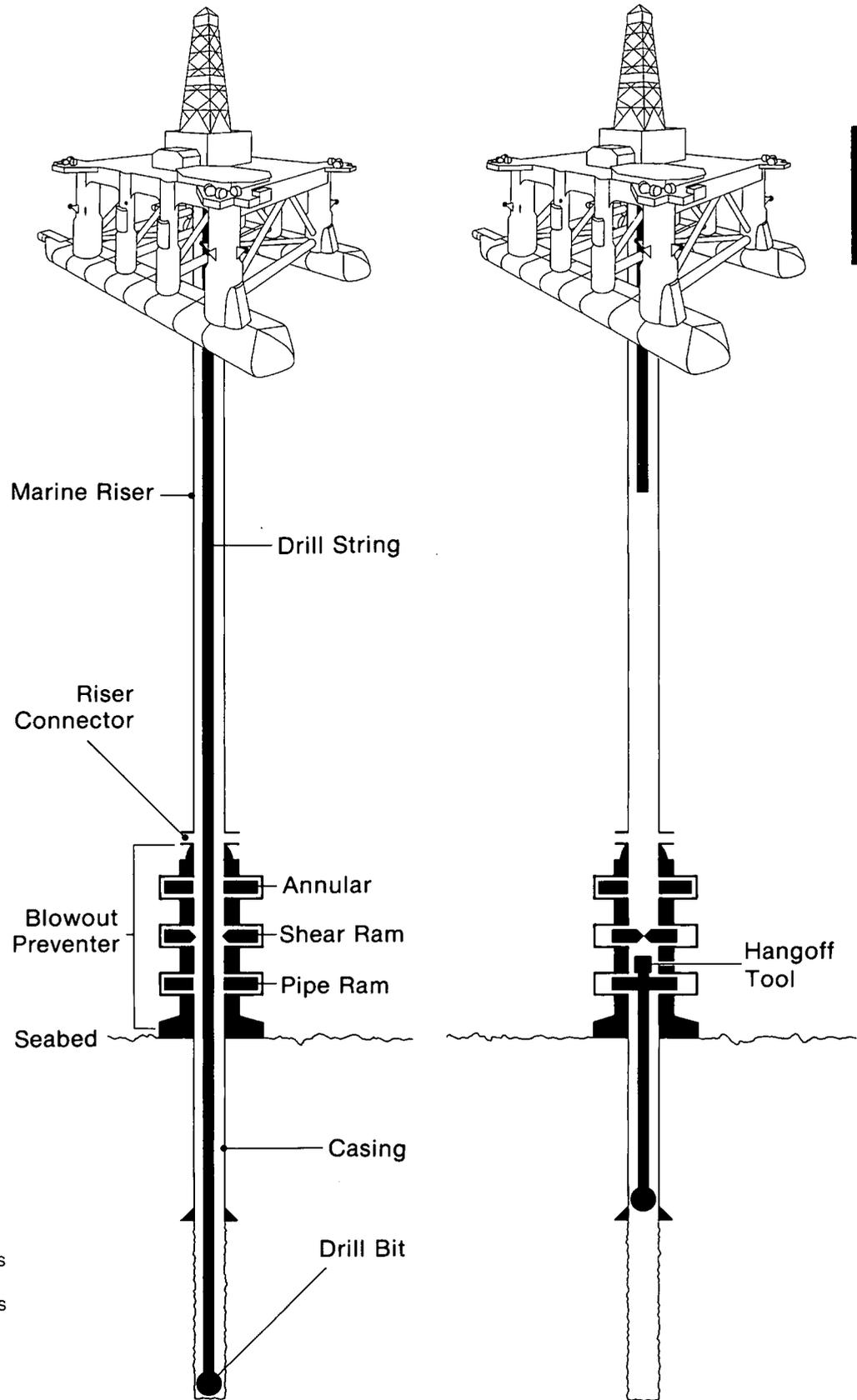
On offshore wells, a *guidebase* is usually placed on the seabed at the same time as the first string of casing is cemented in place. The guidebase is simply a template which is fastened to the first string of casing. A number of wire *guidelines*, running between the guidebase and the rig, are used to position equipment subsequently lowered into place.

After the first string of casing and the guidebase have been secured, a *marine riser* and *diverter system* are connected to the casing. The marine riser consists of large diameter pipe which is used to provide a return flowpath between the drill rig and the sea floor for drilling fluid. The diverter, a low-pressure blowout preventer, is placed on the top of the marine riser to divert the flow of formation fluids or gases away from the drill rig, in the event that control of the well is lost and a "kick" or blowout occurs.

Once the marine riser and diverter are installed, drilling resumes with a smaller drill bit. The new bit and drill string are lowered from the drill rig through the marine riser and the casing which is already cemented in place. The well is drilled to the depth at which the next string of casing, the *surface casing*, will be placed. The drill string, drill bit, marine riser and diverter are pulled up and placed on board the rig. The surface casing is then placed in the well, below the first casing, and cemented in place. The *blowout preventer stack* is then lowered to the sea floor attached to the marine riser, and secured to the top of the surface casing.

The subsequent operations consist of drilling further sections of open hole, removing the drill string and drill bit, and then installing and cementing strings of casing until the final depth of the well is reached.

Offshore drilling involves the same principles governing drilling on land. However, there are two major factors which distinguish floating drilling units from land drill rigs: the motions of the floating drilling unit and the physical separation of the drilling unit from the seabed. The evolution of float-



LEFT - NORMAL DRILLING

RIGHT - HUNG-OFF The drill string and bit have been pulled up and a hang off tool has been inserted in the string. The tool has been 'Landed' on a pipe ram in the BOP, stack, and the drill string above the tool has been unthreaded and raised into the riser. The drill string still in the well is now supported by the pipe ram. The shear ram is closed to further seal the well.

ing drilling systems has centred on developing methods to accommodate these differences.

MOTION COMPENSATION

One of the principal aims in the design of free-floating mobile offshore drilling units (MODUs) is the reduction of the unit's natural motion characteristics. The operating efficiency of conventional ship-shaped drilling units is reduced when sea conditions exceed 10-12 feet, whereas the semisubmersible unit operates effectively in rough sea conditions because its design places a large portion of the hull under water.

In addition to structural design features aimed at reducing motion effects, motion compensation systems have been developed to reduce further the effects of heave, pitch, roll, surge and sway. The efficiency of offshore drilling is adversely affected by any increase in these motions, until a point is reached where continued drilling operations become unsafe. Heave, usually the principal motion affecting operations, is accommodated by systems which include drill string compensators, marine riser tensioners, guideline tensioners and slip joints. Roll and pitch motions are accommodated by ball or flex joints located under the drill floor and/or on the lower marine riser package. Surge and sway motions are constrained by the unit's station-keeping (mooring) system.

MARINE RISER

The physical separation of the drilling unit from the seabed posed problems to the industry, particularly when offshore exploratory drilling moved into deeper water. To accommodate the required link between the drilling unit and the seabed, the marine riser was developed.

At the top of the riser a telescoping joint, called the slip joint, is fixed. The slip joint, which operates like a piston, is designed so that its inner barrel is connected to the rig just below the drill floor and its outer barrel is connected to the marine riser. The rig and the inner barrel of the slip joint move together vertically with the heave.

The slip joints used in offshore drilling are designed to cope with a total vertical movement of the rig of 60 feet. In such instances the rig's heave would be 30 feet – one half the total up and down movement. Therefore the rig can theoretically move up and down 30 feet without endangering the subsea equipment to which the marine riser is con-

nected. Similarly, the ball joints at the top or bottom of the slip joint can accommodate lateral movements up to 10 degrees from the vertical. The 30 feet heave and 10 degree movement from the vertical represent theoretical design limits; operational limits are lower in order to provide a margin of safety. Should environmental conditions reach or exceed the established limits, the marine riser is usually *disconnected* from the subsea equipment to allow the unit to float freely without risking damage to the seabed installation.

HANGING-OFF AND DISCONNECTING

Prior to disconnecting the marine riser the drill pipe must either be pulled out of the well or *hung-off* in the blowout preventer stack. The hang-off procedure is carried out to secure the well and to prepare for the disconnect in such a manner that formation fluids cannot escape from the well and that the well can subsequently be re-entered as simply as possible.

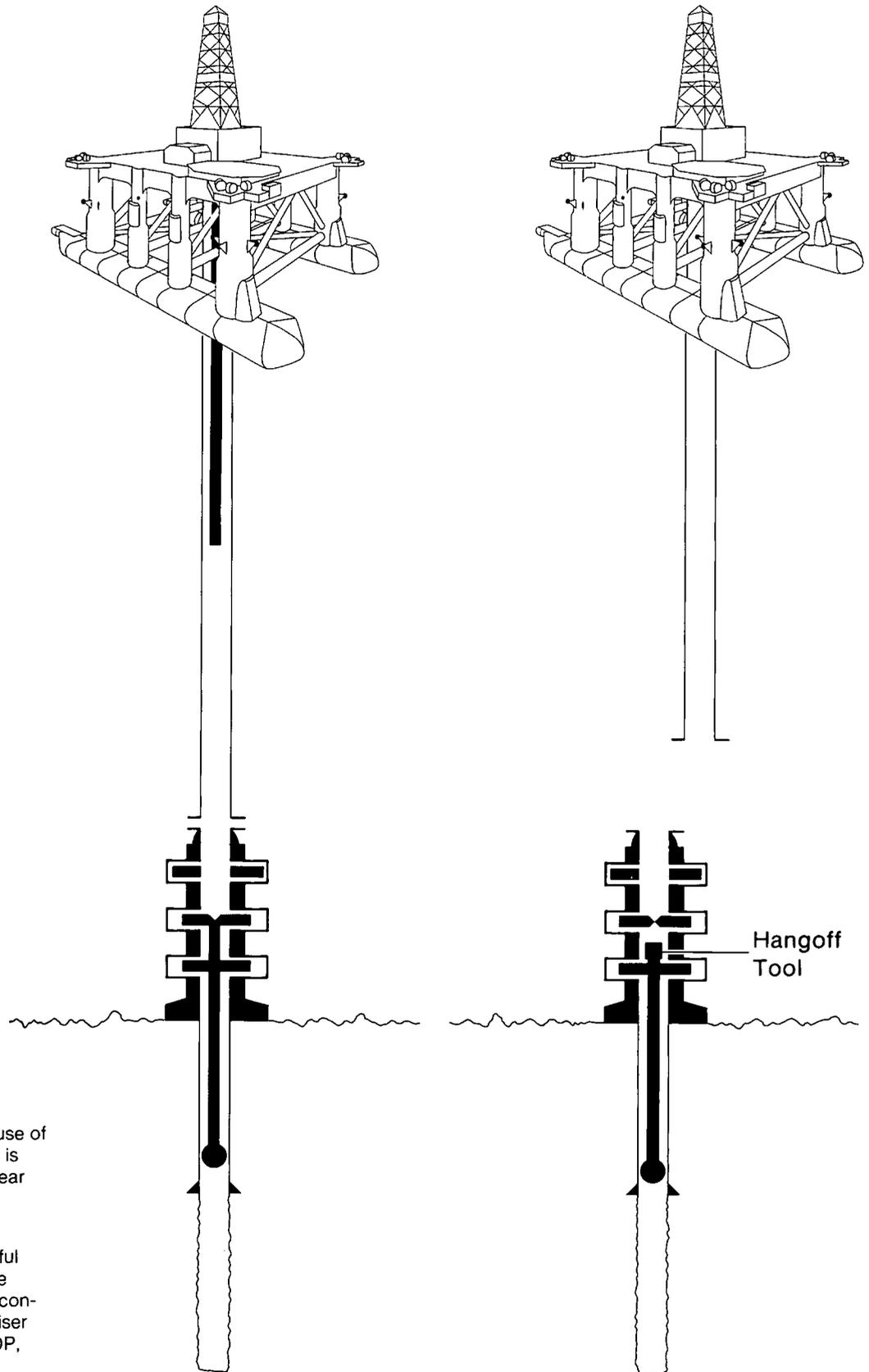
Assuming that the operation at the time is drilling and that sufficient time is available, a typical hang-off sequence begins with a volume of heavy mud being pumped into the wellbore to counteract the loss of hydrostatic head which will occur when the riser is disconnected. Drill pipe is pulled out of the well until the bit is located inside the last string of casing. A further length of drill pipe is then pulled, which is at least equal to the distance from the rotary table to the ocean floor, and a *hang-off tool* is installed in the drill string at the surface. The drill string is run back into the well until the hang-off tool reaches the blowout preventer stack, and the bit is again near the bottom of the casing string.

The ram blowout preventers (pipe rams) are closed and the weight of the drill string is suspended on the pipe rams using the hang-off tool. The drill pipe is then unthreaded from the hang-off tool and pulled out of the blowout preventer stack. Finally, the blind (shear) rams are closed above the hang-off tool to seal the well. At this point the drill string has been hung-off and the marine riser can be disconnected from the blowout preventer stack, if necessary.

This procedure for hanging-off can take a significant amount of time depending upon several factors. In case of an emergency the process can be completed in a very short time by shearing the drill pipe. In this procedure the pipe rams are simply closed around

a joint of drill pipe to support the weight of the drill string. The drill pipe above the pipe rams is then cut using the shear rams. The shear rams serve both to cut the drill pipe and to seal off the well. When this procedure has been completed the marine riser can be disconnected from the blowout preventer stack and the rig is free to move off the site, although re-entry into the well is more complex than when the pipe has been hung-off.

The procedure for disconnecting the marine riser is the same whether a hang-off tool has been used or the pipe has been sheared. The riser tensioners are adjusted to compensate for the entire weight of the marine riser and disconnection can then be effected through the hydraulic control of the connecting mechanism. Once it has been disconnected, the marine riser is pulled up using the riser tensioners until the slip joint is in its closed position. When required, the disconnect process can be completed in a matter of minutes.



LEFT – SHEARED OFF When the use of a hang-off tool is impossible, the string is supported by the pipe ram, and the shear ram is closed, severing the pipe.

RIGHT – HUNG-OFF AND DISCONNECTED After completing a successful hang-off or shear, the drill string can be pulled out of the riser, and the riser disconnected from the BOP stack. With the riser pulled up to avoid collision with the BOP, the rig is free to move off station.

CERTIFICATION

APPENDIX C

APPENDIX C

CERTIFICATION

-
- | | |
|---|-----|
| 1. BUILDER'S CERTIFICATE | 215 |
| Issued at Tokyo, Japan by Mitsubishi Heavy Industries, Ltd.
May 28, 1976. | |
| 2. CERTIFICATE OF REGISTRY | 216 |
| Issued at New Orleans, Louisiana by the United States Coast
Guard, August 5, 1980.
Exhibit #4. | |
| 3. CERTIFICATE OF INSPECTION | 218 |
| Completed and issued at Providence, Rhode Island by the United
States Coast Guard December 27, 1979.
Exhibit #5. | |
| 4. CERTIFICATES ISSUED FOR THE <i>OCEAN RANGER</i> | 222 |
| American Bureau of Shipping and the United States Coast
Guard.
Extracts from Exhibits #5, 6, 7, 8, 9, and 83. | |
| 5. CORRESPONDENCE REGARDING MODU <i>OCEAN RANGER</i> | 222 |
| INSPECTION FOR U.S. CERTIFICATION
From R.A. Sutherland, United States Coast Guard to Ocean
Drilling & Exploration Company December 18, 1979.
Exhibit #179. | |
| 6. COGLA'S DIRECTIVE TO OFFSHORE OPERATORS REGARDING | 224 |
| SURVIVAL SUITS
July 7 and July 28, 1981.
Extract from Exhibit #50. | |

Item C-1

**MITSUBISHI HEAVY INDUSTRIES, LTD.
TOKYO, JAPAN**

28th. May, 1976

Builder's Certificate

This is to certify that we, Mitsubishi Heavy Industries, Ltd., have completed the construction at Hiroshima, Japan, in May, 1976 of the drilling vessel named *Ocean Ranger* as described hereinafter, for and on behalf of Canan Offshore Limited, Hamilton, Bermuda, and K/S Fearnley Drilling & Exploration A/S N, Oslo, Norway.

Official No.	7102-PEXT
Call Letters	3ENB
Name of Vessel	<i>Ocean Ranger</i>
Kind of Vessel	Semi-Submersible, Self-Propelled Drilling Vessel
Port of Registry	Panama, Republic of Panama
Length	393.11 feet
Breadth	262.13 feet
Height	151.50 feet
Designed Draft	80.00 feet
Gross Tonnage	14,913.66 tons
Net Tonnage	9,234 tons
Number of Decks	Two (2)
Principal Deck Machineries	One (1) set of Oil Drilling Machinery Eight (8) DC Generators Two (2) AC Generators (Diesel Engine Driven) One (1) Emergency Generator (Diesel Engine Driven) Three (3) Diesel Engine Driven Cranes Twelve (12) sets of Winch/Windlass (Electric Driven)

BUILDER:
Mitsubishi Heavy Industries, Ltd.

Yasuharu Yoshikechi
Attorney-in-fact

Item C-2

The information from the Certificate of Registry given on the facing page is taken from Exhibit #4, as entered in evidence October 25, 1982. The Certificate reproduced at right is identical to exhibit #4 except for minor discrepancies. Exhibit #4 was not suitable for reproduction.

THE UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

OFFICIAL NUMBER
6 1 3 6 4 1
 REGISTERED SERIAL AND RADIO CALL LETTERS
449

Registered at NEW ORLEANS, LA 1979
 Rebuilt at _____
 Re-measured at Philadelphia, PA 1980


Certificate of Registry
 IN PURSUANCE OF CHAPTER ONE, TITLE XLVIII
 "REGULATION OF COMMERCE AND NAVIGATION," REVISED STATUTES OF THE UNITED STATES
 (CHAPTER 2, TITLE 46, "SHIPPING," CODE OF LAWS OF THE UNITED STATES)

I, W. Ly Coleon, 1600 Canal Street, New Orleans, Louisiana 70111, Secretary
 having taken and subscribed the oath required by law, and having sworn that
ODECO INTERNATIONAL CORPORATION (71-0435344)
 1600 Canal Street, New Orleans, Louisiana 70161
 INCORPORATED UNDER THE LAWS OF THE STATE OF DELAWARE

is
 the sole owner of the vessel called the
OCEAN PANGER, of NEW ORLEANS, LOUISIANA
 whereof LEWIS H. PITMAN is at present master, and is a citizen of the United States,
 and that the said vessel was built in the year 1979 at MIROSHIMA, JAPAN of Steel
 as appears by P. R. 117, issued at New Orleans, LA on 27 December 1979 and Martin Paul, Admeasurer
 and Said Registry and Paul Martin Admeasurer having certified that
 the said vessel is a Electric Sewer, Oil vessel; that she has
 one deck One Mast, One
one deck one hatch, one mast, a Square Square and a Square Square; that she has
 her register length 393.1 feet, her register breadth 79 feet, her register depth 79 feet,
 her height 79 feet; that she measures as follows:

	TONS	LENGTH
Capacity under tonnage deck,	14337	54
Capacity between decks above tonnage deck,		
Capacity of enclosures on the upper deck, viz: Forecastle, bridge, poop, break,	480	87
houses—rooms, side, mast, trunks, excess hatchways, light and air	14618	81
Gross tonnage,		
Deductions under Section 1153, Revised Statutes, as amended (Section 77, Title 46, United States Code):		
Crew space, 1435.47; Master's cabin, Ballast Pump 225.27		
Steering gear, 17.30; Anchor gear, 45.90; Boatswain's stores, 75.37		
Chart house, 22.04; Donkey engine and boiler, 16.91		
Storage of sails, 350.18; Propelling power (actual space), 32713 x PHS = 851.93	2901	69
Total deductions,		
Net tonnage,		
11917		

The following-described spaces, and no others, have been omitted, viz: Forepeak, afterpeak, other spaces (except doubly
 bottoms) for water ballast, 3393.78; open forecastle, open bridge, open poop, open shelter deck, 1280.15
 cabins, companions, 16.09; galley, 78.23; skylights, wheelhouse, 23.51; water closets, 61.15; anchor gear, 1376.62
 donkey engine and boiler, steering gear, light and air over propelling machinery, other machinery spaces

And Lewis H. Pitman, Agent having agreed to the description and measurements above specified, the vessel has been duly
REGISTERED at the PORT:
 GIVEN under my hand and seal at the PORT of NEW ORLEANS, LOUISIANA
 this _____ day of _____
 in the year One Thousand Nine Hundred and _____


 By direction _____
 Documentation Officer
 Officer in Charge, Name Inspection.

1. Master and address of person by whom seal or affirmation was made.
 2. No ballast information when necessary.
 3. Ballast information when necessary.
 4. Leave the name and business address of the owner. If there are two or more owners give the name and business address of one of the owners. If one has been designated give the proportion owned by him. If followed by the name of the other owners and the proportion owned by each. If any owner is a corporation, give the corporate name followed by the words "Incorporated under the laws of the State of _____" Underlying the appropriate State name.
 5. Leave the name exactly as it appears on the preceding document, or in the case of a first document, as it appears on the application for official number. If the vessel has borne another name or a number then number prior to destination or information, give each such name or number in parentheses, preceded by the prefix "Ex-". Immediately

Item C-3



UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

This Certificate Expires 27 DECEMBER, 1981

Certificate of Inspection

VESSEL OCEAN RANGER		OFFICIAL NUMBER 615641	CLASS Column stabilized drilling vessel
GROSS TONS 14,913	NET TONS 12,097	LENGTH 398'	HOME PORT New Orleans, Louisiana
YEAR BUILT 1976	PLACE BUILT Hiroshima, Japan	YEAR REBUILT --	HULL CONSTRUCTED OF Steel (a)
OPERATOR Ocean Drilling and Exploration Company		OPERATOR'S ADDRESS P.O. Box 61780, New Orleans, Louisiana 70161	
OWNER Ocean Drilling and Exploration Company		OWNER'S ADDRESS P.O. Box 61780, New Orleans, Louisiana 70161	

The inspection of the above named vessel having been completed at Providence, Rhode Island on the 27 day of December, 1979, I hereby certify that said vessel is in all respects in conformity with the applicable vessel inspection laws and the rules and regulations prescribed thereunder. The following complement of licensed officers and crew is required to be carried; included in which there must be 7 (b) Certified Lifeboatmen and 2 Certificated Tankermen:

<u>1 (c)</u> Master	Master & 1st Class Pilot	<u>4</u> Able Seamen	<u>1 (c)</u> Chief Engineer	Firemen/Watertenders
Chief Mate	Class Pilot	<u>2</u> Ordinary Seamen	1st Assistant Engineer	<u>3</u> Oilers
2d Mate	Radio Officer	Deckhands	2d Assistant Engineer	
<u>3 (c)</u> Mate(s)	Operator(s)		<u>3 (c)</u> Ass't Engineer(s)	

In addition the vessel may carry 82 other persons in the crew, 82 passengers, 82 persons in addition to the crew, and 82 Industrial Personnel. Total persons allowed 100.

Route permitted and conditions of operation: ASBESTOS
 (a) High tensile steel. Special welding procedures required. See construction plans.
 (b) Certified Lifeboatman shall be provided at all times to man primary lifesaving equipment for 100% of the persons on board and also when in navigation to man sufficient inflatable liferafts to accommodate 50% of the persons on board.
 (c) Master and one mate to hold unlimited licenses; all other officers may hold special industrial licenses appropriate for the use of operation.
 When the vessel is navigated 16 hours or less in a 24 hour period, the required crew is:
1 Master 1 Radio Officer 1 Ordinary Seaman 1 Ass't Engineer (Ind. Lic.)
1 Mate (Ind. Lic.) 3 Able Seamen 1 Chief Engineer (Ind. Lic.) 2 Oilers
8 Industrial Personnel may also be carried - Total persons allowed 100
 When the vessel is navigated more than 16 hours but less than 72 hours, the required crew is:
1 Master 1 Radio Officer 1 Ordinary Seaman 2 Ass't Engineers (Ind. Lic.)
1 Mate (Ind. Lic.) 3 Able Seaman 1 Chief Engineer (Ind. Lic.) 3 Oilers
10 Industrial Personnel may also be carried - Total persons allowed 100
 When the vessel is under tow with propulsion assist, the required crew is:
1 Master (Ind. Lic.) 2 Able Seamen 2 Engineers (Ind. Lic.)
1 Mate (Ind. Lic.) 1 Ordinary Seaman 3 Oilers
11 Industrial Personnel may also be carried - Total persons allowed 100
 When the vessel is under tow in the local area or moored on location, the required crew is:
1 Master (Ind. Lic.) 2 Able Seamen 1 Ordinary Seaman
9 Industrial Personnel may also be carried - Total persons allowed 100.

EQUIPMENT AND INSPECTION DATA

Lifesaving equipment provided for <u>100</u> persons, viz: <u>1</u> Lifeboats on port side for <u>50</u> persons <u>1</u> Lifeboats on starboard side for <u>50</u> persons <u>2</u> Motor lifeboats (included in total lifeboats) <u>10</u> Inflatable liferafts for <u>200</u> persons <u>1</u> Life floats for <u>0</u> persons <u>8</u> Ring life buoys <u>1</u> Rescue boats Life preservers for <u>127</u> adults and <u>0</u> children	Stability letter issued <u>26 December 1979 (temp)</u> Drydocked <u>Special survey due 1 June 1980</u> Tail shaft drawn <u>Special survey due 1 June 1980</u> Propulsion <u>Motor - diesel electric</u> Shaft H.P. <u>14,000</u> Fuel <u>Diesel</u> Pressure vessels examined <u>A/Rt 56 H/P, 3 S/A, 3 S/S, 1 L/P</u>	Aux BOILERS: Records at <u>Los Angeles, CA</u> Number <u>3</u> Year built <u>1974</u> Type <u>WT</u> Mr. <u>Clayton Mfg Co.</u> Mountings opened <u>Due Dec 1983 (1, 2, 3)</u> Mountings removed <u>Due Dec 1987 (1, 2, 3)</u> Hydraulic test <u>Due Dec 1981 (1, 2, 3)</u> Maximum steam pressure allowed <u>200 psi</u>
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Fire extinguishing systems: Fixed <u>CO2 PL, EG, Main Gen, Rm, Mach Shop, Elect Cont Rm, Port and stbd prop, Foam, halo deck</u> Semiportable <u>1 BIII and 1 BV Halo Deck</u>	Fire extinguishers No. <u>12</u> Class <u>AII</u> <u>6</u> <u>BII</u> <u>2</u> <u>BV</u> <u>2</u> <u>CI</u>	Fire hose, total length <u>2050</u> ft. <u>2</u> Fire axes <u>3</u> Fire pumps	Inspected and approved for the carriage of: <u>---</u> Capacity: <u>---</u>
---	---	--	--

PERIODIC REINSPECTIONS <u>27</u> <u>CII</u>		<u>R. A. SUTHERLAND, CAPT, USCG</u> (Officer in Charge, Marine Inspection) PROVIDENCE, RHODE ISLAND (Inspection Zone)
DATE	INSPECTION ZONE	
	SIGNATURE	

This Certificate Expires 27 December, 19 81

UNITES STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

CERTIFICATE OF INSPECTION

VESSEL OCEAN RANGER			OFFICIAL NUMBER 615641	CLASS Column stabilized drilling vessel
GROSS TONS 14,913	NET TONS 12,097	LENGTH 398'	HOME PORT New Orleans, Louisiana	
YEAR BUILT 1976	PLACE BUILT Hiroshima, Japan	YEAR REBUILT -	HULL CONSTRUCTED OF Steel (a)	
OPERATOR Ocean Drilling and Exploration Company			OPERATOR'S ADDRESS P.O. Box 61780, New Orleans, Louisiana 70161	
OWNER Ocean Drilling and Exploration Company			OWNER'S ADDRESS P.O. Box 61780, New Orleans, Louisiana 70161	

The inspection of the above named vessel having been completed at Providence, Rhode Island on the 27 day of December, 19 79, I hereby certify that said vessel is in all respects in conformity with the applicable vessel inspection laws and the rules and regulations prescribed thereunder. The following complement of licensed officers and crew is required to be carried; included in which there must be 7(b) Certificated Lifeboatmen and - Certificated Tankermen:

<u>1(c)</u> Master	<u>-</u> Master & 1st Class Pilot	<u>4</u> Able Seamen	<u>1(c)</u> Chief Engineer	<u>-</u> Firemen/Watertenders
<u>-</u> Chief Mate	<u>-</u> Class Pilot	<u>2</u> Ordinary Seamen	<u>-</u> 1st Assistant Engineer	<u>3</u> Oilers
<u>-</u> 2d Mate	<u>1</u> Radio Officer	<u>-</u> Deckhands	<u>-</u> 2d Assistant Engineer	
<u>3(c)</u> Mate(s)	<u>-</u> Operator(s)		<u>3(c)</u> Ass't. Engineer(s)	

In addition the vessel may carry - other persons in the crew, - passengers, - persons in addition to the crew, and 82 Industrial Personnel. Total Persons allowed 100.

Route permitted and conditions of operation: OCEANS

(a) High tensile steel. Special welding procedures required. See construction plans.

(b) Certificated Lifeboatmen shall be provided at all times to man primary lifesaving equipment for 100% of the persons on board and also when in navigation to man sufficient inflatable liferafts to accommodate 50% of the persons on board.

(c) Master and one Mate to hold unlimited licenses; all other officers may hold special industrial licenses appropriate for the mode of operation.

When the vessel is navigated 16 hours or less in a 24 hour period, the required crew is:

1 Master	1 Radio Officer	1 Ordinary Seamen	1 Ass't Engineer (Ind. Lic.)
1 Mate (Ind. Lic.)	3 Able Seamen	1 Chief Engineer (Ind. Lic.)	2 Oilers

89 Industrial Personnel may also be carried — Total persons allowed 100.

When the vessel is navigated more than 16 hours but less than 72 hours, the required crew is:

1 Master	1 Radio Officer	1 Ordinary Seamen	2 Ass't Engineers (Ind. Lic.)
2 Mates (Ind. Lic.)	3 Able Seamen	1 Chief Engineer (Ind. Lic.)	3 Oilers

86 Industrial Personnel may also be carried — Total persons allowed 100.

When the vessel is under tow with propulsion assist, the required crew is:

1 Master (Ind. Lic.)	2 Able Seamen	2 Engineers (Ind. Lic.)
1 Mate (Ind. Lic.)	1 Ordinary Seaman	2 Oilers

91 Industrial Personnel may also be carried — Total persons allowed 100.

When the vessel is under tow in the local area or moored on location, the required crew is:

1 Master (Ind. Lic.)	2 Able Seamen	1 Ordinary Seaman
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96 Industrial Personnel may also be carried — Total persons allowed 100.

EQUIPMENT AND INSPECTION DATA

Lifesaving equipment provided for <u>100</u> persons, viz: <u>1</u> Lifeboats on fwd for <u>50</u> persons <u>1</u> Lifeboats on aft side for <u>50</u> persons <u>2</u> Motor Lifeboats (included in total lifeboats) <u>10</u> Inflatable liferafts for <u>200</u> persons <u>-</u> Life floats for <u>-</u> persons <u>-</u> persons <u>8</u> Ring life buoys <u>1</u> Rescue boats Life preservers for <u>127</u> adults and <u>0</u> children	Stability letter issued <u>26 December 1979 (temp)</u> Drydocked <u>Special survey due 1 June 1980</u> Tail shaft drawn <u>Special survey due 1 June 1980</u> Propulsion <u>Motor — diesel electric</u> Shaft H.P. <u>14,000</u> Fuel <u>Diesel</u> Pressure vessels examined <u>A/R: 56 H/P, 3 S/A, 3 S/S, 1 L/P</u>	Aux. BOILERS: Records at <u>Los Angeles, CA</u> Number <u>3</u> Year built <u>1974</u> Type <u>WT</u> Mfr. <u>Clayton Mfg. Co.</u> Mountings opened <u>Due Dec 1983 (1,2,3)</u> Mountings removed <u>Due Dec 1987 (1,2,3)</u> Hydrostatic test <u>Due Dec 1981 (1,2,3)</u> Maximum steam pressure allowed <u>200 psi</u>
Fire extinguishing systems: Fixed <u>C02 PL, EG, Main</u> <u>Gen. Rm, Mach Shop, Elect Cont Rm,</u> <u>Port and stbd prop. Foam, helo deck</u> Semiportable <u>1 BIII and 1 BV Helo Deck</u>	Fire extinguishers No. <u>12</u> Class <u>All</u> <u>6</u> <u>BII</u> <u>2</u> <u>BV</u> <u>2</u> <u>CI</u>	Fire hose, total length <u>2050</u> ft. <u>2</u> Fire axes <u>3</u> Fire pumps

PERIODIC INSPECTIONS	27	CII	R. A. SUTHERLAND, CAPT, USCG (Officer in Charge, Marine Inspection)- PROVIDENCE, RHODE ISLAND (Inspection Zone)
DATE	INSPECTION ZONE	SIGNATURE	

DEPARTMENT OF TRANSPORTATION U. S. COAST GUARD CG-858 (Rev. 8-74)		CERTIFICATE OF INSPECTION AMENDMENT		
NAME OF VESSEL <p style="text-align: center;">OCEAN RANGER</p>			OFFICIAL NUMBER <p style="text-align: center;">615541</p>	
CLASS <p style="text-align: center;">Column stabilized drilling vessel</p>	GROSS TONS <p style="text-align: center;">14,013</p>	HOME PORT <p style="text-align: center;">New Orleans, LA</p>		
WHEN AND WHERE BUILT <p style="text-align: center;">1976 - Hiroshima, Japan</p>				
DATE CURRENT CERTIFICATE OF INSPECTION EXPIRES <p style="text-align: center;">27 December 1981</p>			DATE AND PLACE CURRENT CERTIFICATE OF INSPECTION ISSUED <p style="text-align: center;">27 December 1979, Providence, RI</p>	
The Certificate of Inspection issued to the vessel described above is amended as follows: <div style="text-align: center; margin-top: 50px;"> <p>VESSEL DRYDOCKED: SPECIAL UNDERWATER SURVEY DUE APRIL 1982</p> </div>				
DATE OF ISSUE <p style="text-align: center;">29 April 1980</p>	INSPECTION ZONE <p style="text-align: center;">Providence, R.I.</p>	OFFICER IN CHARGE, MARINE INSPECTION <p style="text-align: center;">R. A. SUTHERLAND, CAPT, USCG</p>		
INSTRUCTIONS				
1. This amendment shall be issued to authorize changes to the conditions or particulars entered on a current valid Certificate of Inspection (Form CG-841 or CG-3753) or to the conditions or particulars entered on a current valid amendment to such Certificate of Inspection. When issued it shall become a part of the Certificate of Inspection which it amends.		3. One copy of this amendment shall be filed in the office of the issuing Officer in Charge, Marine Inspection. In addition one copy shall be distributed to each of the following:		
2. The original of this amendment shall be delivered to the master or owner of the vessel named herein and must be framed under glass with or near the vessel's Certificate of Inspection. If the Certificate of Inspection is not required to be posted, this amendment must be kept on board with the Certificate of Inspection and shown on demand.		a. The Officer in Charge, Marine Inspection who issued the current Certificate of Inspection. b. The Commandant (G-MVI) VIEW NO c. The owner or agent of the vessel named herein.		

Item C-4
Certificates Issued for the *Ocean Ranger*

1. THE CERTIFICATE OF INSPECTION was issued at Providence, Rhode Island by the United States Coast Guard on December 27, 1979, and expired December 27, 1981.
2. THE CERTIFICATE OF CARGO SHIP SAFETY EQUIPMENT was issued at Providence, Rhode Island by the United States Coast Guard on December 27, 1980, and expired December 27, 1981.
3. THE INTERNATIONAL LOAD LINE SURVEY CERTIFICATE, was issued at New York by the American Bureau of Shipping on behalf of the United States Coast Guard on October 30, 1981, under the provisions of the International Convention on Loadlines 1966. The certificate was valid until July 5, 1984 subject to annual survey.
4. THE CARGO SHIP SAFETY CONSTRUCTION CERTIFICATE was issued at New York by the American Bureau of Shipping on April 28, 1980, under the provisions of the International Convention for Safety of Life at Sea, 1960, and was valid until July 31, 1984.
5. THE CARGO SHIP SAFETY RADIO TELEGRAPHY CERTIFICATE was issued at St. John's, Newfoundland, by the American Bureau of Shipping, under the Authority of the Government of Canada on April 16, 1981, under the provisions of the International Convention for Safety of Life at Sea, 1974, and expired April 15, 1982. No exemption was given from the requirement that a continuous watch be kept on 2182 Mhz.
6. ANNUAL CLASS SURVEY, (Hull and Machinery), Annual Load Line Inspection, Annual Cargo Gear Inspection and extension of Tailshaft Survey (Port and Starboard) performed by the American Bureau of Shipping, June 16, 1981, on location off St. John's, Newfoundland. Certificate issued from Halifax, Nova Scotia.

Item C-5
**Correspondence Regarding MODU *Ocean Ranger* Inspection
for U.S. Certification**

Officer in Charge
Marine Inspection Office
John O. Pastore Fed. Bldg.
Providence, RI 02903
Tel.: 401-528-4335
16711
18 December 1979

Ocean Drilling & Exploration Co.
P.O. Box 61780
New Orleans, LA 70161

Attention: Dr. Terry Petty

Subj: MODU *OCEAN RANGER*
398' x 262' x 151' Semi-Submersible Drilling Unit
Non-Classed
Inspection for Certification

Gentlemen:

An initial inspection was conducted on subject drilling unit from 4 through 14 December 1979. The following items are required to be completed prior to issuing a U.S. Coast Guard Certificate of Inspection:

1. Provide an FCC certificate for radios (vessels and lifeboat)
2. Provide and install an Emergency Position Indicating Radio Beacon (EPIRB)
3. Provide certificate of servicing for portable fire extinguishers
4. Provide two (2) firemens' outfits
5. Stencil lifejacket lockers and remote fuel shutoffs
6. Test number 2 boiler low water cutout
7. Provide adequate MESA approved first aid kit for 100 persons
8. Register vessel as a U.S. vessel (obtain Official Number)

The following items to be completed prior to 15 January 1980 or issuance of Certificate of Inspection, whichever is later:

1. Provide CG approved ring buoys (8 required)
2. Provide CG approved lifeboat provisions for both lifeboats
3. Provide two CG approved smoke floats to be attached to ring buoys
4. Paint helicopter landing deck with non-skid paint
5. Mark general alarm with signs as per 46 CFR 108.625
6. Mark CO2 alarms with signs as per 108.627
7. Mark liferafts with signs as per 108.655
8. Inspect and repair fire detection system
9. Add an adequate vent for the CO2 room
10. Provide wind direction indicator for helo deck
11. Mark access to helo deck with warning signs (all three accesses)
12. Replace interior fire hose with CG approved hose and CG approved combination nozzles (alter system to receive these hoses)
13. Provide International shore connection
14. Post fueling procedures
15. Comply with marine portable tank (MPT) regs.
16. Operate foam system take a sample and have it analyzed

To be accomplished prior to bringing fuel aboard for helicopter refuelling:

1. Install remote fuel pump shutdown at main access
2. Mark fuel hose storage in accordance with regulation
3. Make visible the fuel pump operation indicator light

To be accomplished prior to 1 June 1980 or issuance of Certificate of Inspection, whichever is later:

1. Install a second radar independently powered from the existing one
2. Submit for review by the Commandant, USCG, plans for special survey of underwater body, and accomplish special survey as required
3. Submit for review and obtain approval of Fire Control and Safety Plan

To be done prior to next Inspection for Certification:

1. Comply with 46 CFR 108.506 davit launched liferafts or acceptable substitute
2. Replace lifeboats and davits with CG approved or obtain approval for existing ones
3. Obtain approval of fixed CO2 system
4. Obtain CG approval of fire detection system

All above items to be completed to the satisfaction of the cognizant Officer in Charge, Marine Inspection.

Sincerely,

R.A. SUTHERLAND
Captain, U.S. Coast Guard
Officer in Charge,
Marine Inspection

Item C-6
COGLA'S Directive to Offshore Operators Regarding Survival Suits

NOTE: All telexes contained in the Appendix are reproduced as entered in evidence. Typographical errors are reproduced from the originals.

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SHELL CNTR CGY
EMR RMCB OTT

NOTICE TO OPERATORS

SURVIVAL SUITS FOR EXPLORATION VESSELS

BECAUSE OF THE COLD WATERS COMMON TO CANADIAN OFFSHORE EXPLORATION REGIONS, IT IS APPARENT THAT SURVIVAL SUITS ARE AS IMPORTANT AS LIFE JACKETS FOR THE SAFETY OF PERSONNEL ON BOARD EXPLORATION VESSELS. MORE LIVES MAY HAVE BEEN SAVED DURING THE RECENT LOSS OF THE *ARCTIC EXPLORER* HAD SURVIVAL SUITS BEEN AVAILABLE.

WHILE IT WILL NOT BE A STRICT REQUIREMENT DURING THIS YEAR'S EXPLORATION SEASON, ALL OPERATORS SHOULD HAVE A SURVIVAL SUIT FOR EACH PERSON ABOARD A DRILLING UNIT, SUPPLY VESSEL AND GEOPHYSICAL VESSEL AS SOON AS PRACTICAL.

IT IS A MOOT POINT WHETHER DONNING OF THE SURVIVAL SUIT SHOULD BE PART OF THE LIFEBOAT DRILL. IN AN ACTUAL EMERGENCY IT COULD BE LEFT TO THE INDIVIDUAL JUDGEMENT WHETHER THE SURVIVAL SUIT BE PUT ON BEFORE THE LIFE JACKET. IN ANY EVENT IT IS IMPORTANT THAT THE SUITS BE AVAILABLE FOR USE IF TIME PERMITS. IT IS RECOMMENDED THAT THE SUITS BE STORED AT SEVERAL POINTS ON THE VESSEL ADJACENT TO PRINCIPAL MANWAYS AND AT THE LIFEBOAT STATIONS.

THE TYPE OF SUIT RECOMMENDED IS THE LIGHTWEIGHT MULTI-FAB DRY TYPE WHICH CAN READILY FIT UNDER A LIFE JACKET. ANY COMMENTS YOU MAY HAVE ON THIS REQUIREMENT SHOULD BE DIRECTED TO OTTAWA. PHONE (613) 993-3760 OR TELEX NO 053-4366.

FREDERICK LEPINE
CONSERVATION ENGINEER
CANADA OIL AND GAS LANDS ADMINISTRATION

July 7, 1981

ATTN: E. HOPKINS

•
SHELL CNTR CGY

SHELL CNTR CGY
EMR RMCB OTT

SURVIVAL SUITS FOR EXPLORATORY VESSELS ON CANADA LANDS

FURTHER TO TELEX OF JULY 7, 1981 CONCERNING THE PROVISION OF SURVIVAL SUITS FOR ALL PERSONNEL ABOARD EXPLORATION VESSELS ON CANADA LANDS, INITIAL COMMENT FROM INDUSTRY SUGGESTS TWO TYPES OF SUITS COULD BE SUITABLE.

- A. A LIGHT-WEIGHT MOISTURE PROOF SUIT WITH GOOD THERMAL INSULATION. A LIFE-JACKET WOULD BE A NECESSARY SUPPLEMENT. THESE SUITS DO NOT REQUIRE MUCH STORAGE SPACE AND ALLOW THE WEARER GREATER FREEDOM OF MOVEMENT. THEY ARE PARTICULARLY SUITABLE FOR HELICOPTER FLIGHTS AND FOR WORKING SITUATIONS SUCH AS THE DECK OF A SUPPLY OR SEISMIC VESSEL.
- B. THE CANADIAN COAST GUARD FAVOURS AND APPROVES AN INSULATED BUOYANT IMMERSION SUIT THAT INCLUDES COVERING FOR THE HANDS AND FEET AND PROVIDES BUOYANCY WITH HYPOTHERMIC PROTECTION. THE CANADIAN COAST GUARD HAS ESTABLISHED SPECIFICATIONS FOR THIS TYPE OF SUIT INCLUDING THE REQUIREMENT THAT IT BE PUT ON IN ONE MINUTE. THESE SUITS IN GENERAL PROVIDE BETTER THERMAL PROTECTION AND ARE BEST FOR ACCOMMODATION VESSELS, CREW QUARTERS AND ARTIFICIAL ISLANDS.

YOU ARE INVITED TO PROVIDE FURTHER COMMENT TO MYSELF OR DR. JAN MERTA AT OTTAWA (613) 993-3760 OR TELEX 053 4366.

F.H. LEPINE
CHIEF
DRILLING AND OPERATIONS
OPERATIONS AND CONSERVATION DIVISION
RESOURCE MANAGEMENT
CANADA OIL AND GAS LANDS ADMINISTRATION
OTTAWA

July 28, 1981

The 2 preceding telexes were sent to the following:

cc: Shell Calgary	Attention: E. Hopkin	Telex no.	038 24792
Petro-Canada Calgary	Attention: D. Duff		038 27574
Petro-Canada St. John's	Attention: G. Lever		016 4027
Mobil Oil Dartmouth	Attention: Mathews		019 22580
Mobil Oil St. John's	Attention: S. Romansky		016 4145
BP Canada Calgary	Attention: Alan Ace		038 24782
Chevron Standard Calgary	Attention: R. Richardson		
	L. Zerr		038 21645
H B O G Calgary	Attention: K. Putnam		038 21794
RMB Dartmouth			019 31557
RMB St. John's			016 4031
DINA Hull	Attention: T. Starr		3711
DINA Yellowknife	Attention: M. Smith		034 45519
Dome Calgary	Attention: S. Montgomery		038 22626
	B. Barnard		
Dome Tuk.	Attention: L. Prather		031 44508
Gulf Calgary	Attention: C.E. Fidler		038 24551
	R.P. Cote		
Esso Resources Calgary	Attention: Ron Royal		
	H. Sangster		038 24534
CCG MUT Ottawa	Attention: B.D. Thorne		053 3128
CPA Calgary	Attention: Mr. Smyth	Telecopier	261 4622
IPAC Calgary	Attention: J. Porter	Telecopier	261 4059
SHELL CNTR CGY			
EMR RMCB OTT			

OPERATIONS

APPENDIX D

APPENDIX D

OPERATIONS

- | | |
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Item D-1
Operating History of the *Ocean Ranger*

DATES	OPERATOR	LOCATION
May, 1976		Launching from No. 2 Eba Shipyard of Mitsubishi Heavy Industries, Japan
June 3, 1976	ARCO	Mobilizing from MHI Shipyard in Japan to Alaska
June 26, 1976	ARCO	Cost No. 1, St. George
October 1, 1976	ARCO	Mobilizing from Bering Sea to Gulf of Alaska
October 15, 1976	ARCO	Splome No. 1, Block 72 – Gulf of Alaska
June 3, 1977	ARCO	Mobilizing from Gulf of Alaska – Lower Cook Inlet
June 9, 1977	ARCO	Lower Cook Inlet, Cost No. 1
September 27, 1977	IDLE	Stand by – Lower Cook Inlet
March 12, 1978	IDLE	Mobilizing from Lower Cook Inlet to Resurrection Bay
March 15, 1978	IDLE	Stand by – Seaward Resurrection Bay
December 4, 1978	IDLE	Mobilizing from Resurrection Bay to Port Alberni, B.C.
December 14, 1978	REPAIRS	Stand by – Port Alberni Harbour, B.C.
August 5, 1979	–	Mobilizing from Port Alberni, B.C. to Baltimore Canyon via Straits of Magellan and Narragansett Bay
December 16, 1979	Murphy	Baltimore Canyon, Block 106
May 29, 1980	Philips	Mobilizing from Baltimore Canyon to Ireland
June 17, 1980	Philips	Offshore Ireland
October 20, 1980	Mobil	Mobilizing from Ireland to Newfoundland
November 6, 1980	Mobil	G-55 Hibernia, Newfoundland
February 24, 1981	Mobil	K-18 Hibernia, Newfoundland
June 7, 1981	Mobil	J-87 Hibernia, Newfoundland
November 24, 1981– February 15, 1982	Mobil	J-34 Hibernia, Newfoundland

Item D-2 Background Information on Key Personnel

I. TOOLPUSHER

The Toolpusher on the *Ocean Ranger* was Benjamin Kent Thompson. Thompson was a United States citizen with approximately 15 years experience in the drilling industry. Mr. Thompson initially joined ODECO in 1974 as a floorman and worked on the *Margaret*. In November 1974, he was rehired by ODECO as a floorman and was assigned to the *Ocean Explorer*. He was promoted to Driller in 1978 and to Toolpusher June 1979. As a Toolpusher, he worked on several ODECO rigs including the *Ocean Patriot*, *Ocean Champion*, and *St. Louis*. He was assigned to the *Ocean Ranger* in January 1981 as Toolpusher. Thompson had no formal marine certification from the United States Coast Guard. He attended a Blowout Prevention course at the University of Oklahoma and several in-house ODECO training courses on well control and rig management.

II. MASTER

The Master was Captain Clarence Hauss. Captain Hauss was a United States citizen and held a valid United States Coast Guard licence as Master of Steam and Motor Vessels, Any Gross Tons Upon Oceans. Captain Hauss was employed as a Master and Chief Mate with Bethlehem Steel Corporation from 1956 to 1971. He joined ODECO on March 31, 1981 and was assigned to the *Ocean Victory*. However, during the 10-year period prior to joining ODECO, Captain Hauss worked as a stevedoring superintendent, as a technician in a detoxification centre and as a salesman. He was not active as a Master Mariner. Before joining the *Ocean Ranger* as Master on January 26, 1982, he had served three hitches (28 days/hitch) on the *Ocean Victory* and one hitch on the *Ocean Bounty*.

III. DRILLING FOREMAN

The Senior Mobil Drilling Foreman was Jack Jacobsen, a Canadian citizen who had 16 years experience in the drilling industry. He was 39 years old. In 1966 he began working as a derrickman with Kenting Drilling. In 1971/72 he worked as derrickman and driller with Garnet Drilling. He worked as a driller with Nabors Drilling in 1972/73, and in 1973 he joined SEDCO where he was promoted to Assistant Superintendent in 1974. He remained with SEDCO until 1980 when he joined Mobil as a Drilling Foreman. He had a grade 10 education and had completed courses in Blowout Prevention and Applied Drilling Techniques.

IV. BALLAST CONTROL OPERATORS

The Senior Ballast Control Operator was Donald Rathbun, a United States citizen. He joined ODECO in January 1980, with no previous experience in the drilling industry, either on land or offshore. In March 1980, he was promoted from Roustabout to Ballast Control Operator. Mr. Rathbun's employment with ODECO was entirely on the *Ocean Ranger*. He did not hold any formal marine licences and had not attended any formal ODECO training programs in the ballast control area.

The Junior Ballast Control Operator was Domenic Dyke, a Canadian citizen. Before joining ODECO as a Roustabout in December 1980, he worked with SEDCO as a Roustabout and with Crosbie Offshore Services as a Deckhand on supply vessels. He was promoted from Roustabout to Ballast Control Operator on December 31, 1981, and was serving his second hitch as a Ballast Control Operator at the time of the casualty.

V. RIG ELECTRICIANS

The Senior Electrician was Thomas Donlon, a United States citizen. He had extensive experience as an Electrician and had been assigned to the *Ocean Ranger* since 1977.

Paul Bursey, a Canadian citizen, was the second Electrician on the *Ocean Ranger*. He joined ODECO in June 1981 and was assigned to the *Ocean Ranger*. Prior to joining ODECO, he was employed as a Marine Electrician with Canadian National for seven years.

VI. RIG MECHANIC

The Rig Mechanic was George Gandy, a United States citizen. Gandy had extensive experience in the drilling industry on land and offshore in the Gulf of Mexico, the North Sea, and off West Africa. He joined ODECO as a Rig Mechanic and was assigned to the *Ocean Ranger* in February 1977 for a period of seven months. He was reassigned to the *Ocean Ranger* in March 1980. He held an Ordinary Seaman's ticket issued by the United States Coast Guard.

VII. ELECTRONICS TECHNICIAN

The Electronics Technician was Ted Stapleton, a Canadian citizen. He had completed a 5 year Electronics program at the College of Trades and Technology St. Johns, Newfoundland and received apprenticeship training with the Iron Ore Company of Canada. He had 15 years onshore experience in electronics, prior to joining ODECO in May of 1981. He had experience as a Radio Officer with the Canadian Coast Guard.

It was not possible to obtain background information on several other ODECO employees who were assigned to the *Ocean Ranger* at the time of the casualty. At the time of writing, ODECO had not provided these personnel records.

Item D-3**Communications Equipment On board the *Ocean Ranger*****1 Ship's Radio Systems**

- a) ITT MRU 29B main and reserve transmitters, receivers, auto alarm receiver, auto alarm keyer, antenna switch, power supplies, battery charger and batteries.
- b) VHF marine radios:
 - a) Decca, ITT STR - 24
 - b) Motorola, D33ADA1019AK
- c) EPIRB - AKC Electronics, ACR/RLB 14

2 H.F. Radio Systems

- a) Communications Associated, Inc. model CA35MS with CL36 amplifier. Frequency range: 2-30 MHZ. Power output: 1,000 watts.
- b) Communications Associates, Inc. model CA 35MS. Frequency: 2-30 MHZ. Power output: 100 watts. Two-tone alarm: Honeywell TG502. Power: battery or ship's power.
- c) R.F. Harris Co. Model RF230MAC. Frequency: 2-30 MHZ. Power output: 100 watts.

3 Miscellaneous Communications Systems

- a) CAI model CR19/C754 VHF aircraft radio. Frequency: 122.00 MHZ. Power: 50 watts. Emission: A3A
- b) Scientific Atlanta MARISAT Terminal.
- c) Southern Avionics Aircraft Beacon, Model SS800.

**Item D-4
Ocean Ranger Stability Calculation Forms.**

CONDITION:		LOADING TABLE 1. OPERATIONAL LIGHTWEIGHT								
ITEM	WEIGHT L. TONS	VCG FT.	VERTICAL MOMENT L.T. X FT.	VCG FT.	LONG. MOMENT L. TONS X FT.		TCG FT.	TRANSVERSE MOMENT L. TONS X FT.		
					+AFT	-FWD		-PORT	+STBD	
LIGHTWEIGHT (Excluding all movable anchoring gear, and excluding all operating liquids: traveling gear in highest position).	20,881.3	86.92	1,814,905	4.99 A	104,224		1.11 S		23,191	
TRAVELING GEAR LOWERED. I.T.										
MOORING EQUIPMENT:-										
Wire 12 @ Ft. - 3 1/2"(22.9 #/Ft.)										
Cable 12 @ Ft. - 3 1/4"(105.1 #/Ft.)										
Anchors 12 @ 45,000 # ea.										
Chain connector links.										
Mooring pull down (C 21)										
OPERATING LIQUIDS (TRANSIT) (B 21)										
OPERATIONAL LIGHTWEIGHT										

LOADING TABLE 2A BULK AND SACK STORAGE											
MAXIMUM CAPACITY L. TONS.	ITEM		ACTUAL WEIGHT L. TONS	VCG FT.	VERTICAL MOMENT L.T X FT.	LCG FT.	LONG. MOMENT L.T. X FT.		TCG FT.	TRANS. MOMENT L.T. X FT.	
							+AFT	-FWD		-PORT	+STBD
a 34.4	Bulk Tank #1	820 cu.ft.		142.39		-100.92	-	-	-15.52		-
a 34.4	Bulk Tank #2	820 " "		142.39		- 90.85	-	-	-15.52		-
a 34.4	Bulk Tank #3	820 " "		142.39		-100.92	-	-	+ 0.59		-
a 34.4	Bulk Tank #4	820 " "		142.39		- 90.85	-	-	+ 0.59		-
a 34.4	Bulk Tank #5	820 " "		142.39		- 80.74	-	-	+ 0.59		-
a 34.4	Bulk Tank #6	820 " "		142.39		- 70.67	-	-	+ 0.59		-
a 34.4	Bulk Tank #7	820 " "		142.39		-100.92	-	-	+16.67		-
a 34.4	Bulk Tank #8	820 " "		142.39		- 90.85	-	-	+16.67		-
a 34.4	Bulk Tank #9	820 " "		142.39		- 80.74	-	-	+16.67		-
a 34.4	Bulk Tank #10	820 " "		142.39		- 70.67	-	-	+16.67		-
a 9.2	Surge Tank for Cement	220 " "		143.70		- 73.59	-	-	-13.65		-
b 113.0	Bulk Tank #11	1,875 " "		77.82		- 35.0	-	-	-98.5		-
b 113.0	Bulk Tank #12	1,875 " "		77.82		+ 35.0	-	-	-98.5		-
b 113.0	Bulk Tank #13	1,875 " "		77.82		- 35.0	-	-	+98.5		-
b 113.0	Bulk Tank #14	1,875 " "		77.82		+ 35.0	-	-	+98.5		-
b 116.0	Bulk Tank #15	1,925 " "		108.63		- 35.0	-	-	-98.		-
b 116.0	Bulk Tank #16	1,925 " "		108.63		+ 35.0	-	-	-98.		-
b 116.0	Bulk Tank #17	1,925 " "		108.63		- 35.0	-	-	+98.		-
191.0	Sack Storage Fwd Outbd			142.		- 97.4	-	-	-81.0		-
	" " " "										
202.7	" " Fwd Inbd			142.		- 97.4	-	-	-41.2		-
	" " " "										
202.7	" " Aft Inbd			142.		- 55.2	-	-	-41.2		-
	" " " "										

a. Cement at 94 lb/cu. ft.
b. Barite at 135 lb/cu.ft.

LOADING TABLE 2B DECK SOLID LOADS

MAX. WEIGHT L. TONS	ITEM	ACTUAL WEIGHT L. TONS	VCG FT.	VERTICAL MOMENT LT X FT	LCG FT.	LONG. MOMENT L.T. X FT.		TCG FT.	TRANS. MOMENT L.T. X FT.	
						+AFT	-FWD		-PORT	+STBD
888.0	Pipe Rack Aft Port		15		+77.0		-	-		-
888.0	Pipe Rack Aft Stbd		155.0		+77.0		-	+		-
892.0	Pipe Rack { Ft @ 5" D. Pipe (21#/ft w.TJ) @ 6" Drill Collars @ 8" Drill Collars						-			-
267.0	Set Back		220.3		0		-		+ 8.7	-
280.0	Rack Area									
7.0	Exploration Logging Unit		154.5		+38.0		-		-47.	-
20.0	Store at Mud Return Pit Flat, Shackles, etc		150.0		+19.0		-		-41.	-
85.0	Diving Equipment		140.0		+19.0		-		+50.	-
285.7	Riser Tensioner Load (Max 8 @ 80,000#)		169.0		0		-		0	-
42.9	Guideline Tensioner Load (Max 6 @ 16,000#)		169.0		0		-		0	-
89.3	18 3/4" Blowout Preventer VETCO 10,000#		140.0		0		-		+39.5	-
20.0	21" Lower Riser Package		138.5		0		-		+53.0	-
9.0	Permanent and Temporary Guide		133.0		0		-		+24.0	-
	Stores Containers (Empty)									
66.0	Drilling Equipment Stores									
120.0	Lower Deck Midsnlp Stbd Store		140.0		0				+82.0	-
30.0	Lower Deck Fwd. Box Girder Stores		138.0		-35				+20.0	-
50.0	Lower Deck Aft (Mech., Elec., Spares, Stores)		138.0		+70				+50.0	-
25.0	Crew, Effects, Provisions		150.0		-55.0		-		+50.0	-

LOADING TABLE 3- DECK LOADS (LIQUID)

MAX. WEIGHT L. TONS	MAX F.S. MOM. L. TONS X FT.		TANK	ACTUAL WEIGHT L. TONS	VCG FT.	VERT. MOMENT L. T. FT.	LCG FT.	LONGI. MOMENT L. TONS X FT.		TCG FT.	TRANS MOMENT L. TONS X FT.		FREE SURF MOM L. TONS X FT.	
	LONGI.	TRANS						+AFT	-FWD		-PORT	+STBD	LONGI.	TRANS
12.2	24	52	Fuel Oil Overflow				+ 35.00			+ 62.55				
83.4	29	99	Fuel Oil Sett.				+ 35.00			+ 46.73				
76.1	27	75	Fuel Oil Day Tk. #1				+ 35.00			+ 30.00				
3.3	4	-	Fuel Oil Day Tk. #2				+ 61.94			+ 57.09				
6.7	9	3	Steam Gen. F.O. Tk.				+ 35.00			+ 59.12				
3.2	3	1	Em. Gen. F.O. Tk.				+ 92.52			+ 98.36				
18.8	36	189	Helicopter F.O. Tk.				- 35.00			+ 80.50				
16.0	12	5	Lub Oil Storage				+ 35.00			+ 58.73				
112.0	38	161	Salt Water Tk.				+ 35.00			- 71.73				
103.9	37	139	Drill Water Tk.				+ 35.00			- 90.75				
179.7	63	717	Potable Water Tk.				+ 35.00			- 38.00				
4.9	-	4	Draw Wks Cool Tk.				- 28.90			- 33.99				
1.9	-	-	W/W Cool Tk #1	136.19			+111.94			- 75.39				
1.9	-	-	W/W Cool Tk #2	136.19			+111.94			+ 75.39				
1.9	-	-	W/W Cool Tk #3	135.63			-114.31			- 87.76				
1.9	-	-	W/W Cool Tk #4	136.94			-115.78			+108.34				
105.6	172	305	Mud Pit #1				- 18.61			- 90.76				
106.0	174	306	Mud Pit #2				- 4.67			- 90.76				
106.2	175	306	Mud Pit #3				+ 9.32			- 90.76				
105.4	171	304	Mud Pit #4				+ 23.27			- 90.76				
35.3	6	102	Slugging Pit				- 27.90			- 90.76				
20.7	13	13	Mud Return Pit #1	148.66			+ 14.76			- 33.99				
20.7	13	13	Mud Return Pit #2	148.66			+ 6.76			- 33.99				
20.7	13	13	Mud Return Pit #3	148.66			- 1.25			- 33.99				
20.7	13	13	Mud Return Pit #4	148.66			- 9.25			- 33.99				
20.7	13	13	Mud Return Pit #5	148.66			- 17.26			- 33.99				

LOADING TABLE 4 - LOWER HULLS (FUEL, DRILL WATER & COOLING WATER)

MAX WEIGHT L. TONS	MAX. F.S.MOM. L. TONS X FT.		TANK	ACTUAL WEIGHT L. TONS	VCG FT.	VERT. MOMENT L. T. FT.	LCG FT.	LONGL. MOMENT L. TONS X FT.		TCG FT.	TRANS MOMENT L. TONS X FT.		FREE SURF MOM L. TONS X FT.	
	LONGL.	TRANS						+AFT	-FWD		-PORT	+STBD	LONGL.	TRANS.
797.9	3903	2598	PT 5 Drill Water				-	-	-	-	-	-	-	-
797.9	3903	2598	ST 5 Drill Water				-	-	+	-	-	-	-	-
787.2	4553	2734	PT 13 Drill Water				+	-	-	-	-	-	-	-
787.2	4553	2734	ST 13 Drill Water				+	-	+	-	-	-	-	-
667.6	3862	2319	PT 6 Fuel				-	-	-	-	-	-	-	-
667.6	3862	2319	ST 6 Fuel				-	-	+	-	-	-	-	-
667.6	3862	2319	PT 12 Fuel				+	-	-	-	-	-	-	-
667.6	3862	2319	ST 12 Fuel				+	-	+	-	-	-	-	-
			Port Stern Tube											
41.6	64	71	Cooling Water	41.6	10.54	438	+192.47	8,007	-	-100.00	-	-	-	-
41.6	64	71	Stbd Stern Tube											
41.6	64	71	Cooling Water	41.6	10.54	438	+192.47	8,007	-	+100.00	-	-	-	-

LOADING TABLE 5 - LOWER HULLS (BALLAST)

MAX WEIGHT L. TONS	MAX F.S.MOM. L. TONS FT.		TANK	ACTUAL WEIGHT L. TONS	VCG FT.	VERT. MOMENT L. T. FT.	LCG FT.	LONGL. MOMENT L. TONS FT.		TCG FT.	TRANS MOMENT L. TONS FT.		FREE SURF MOM L. TONS FT.	
	LONGL.	TRANS						+AFT	-FWD		-PORT	+STBD	LONGL.	TRANS.
512.2	755	684	PT 1					-	-	-	-	-	-	-
512.2	755	684	ST 1					-	-	-	-	-	-	-
959.9	7680	2979	PT 2					-	-	-	-	-	-	-
959.9	7680	2979	ST 2					-	-	-	-	-	-	-
959.9	7680	2979	PT 3					-	-	-	-	-	-	-
959.9	7680	2979	ST 3					-	-	-	-	-	-	-
816.6	4001	2663	PT 4					-	-	-	-	-	-	-
816.6	4001	2663	ST 4					-	-	-	-	-	-	-
807.0	4667	2803	PT 7					-	-	-	-	-	-	-
807.0	4667	2803	ST 7					-	-	-	-	-	-	-
710.6	3127	2453	PT 8					-	-	-	-	-	-	-
710.6	3127	2453	ST 8					-	-	-	-	-	-	-
710.7	3127	2453	PT 9					-	-	-	-	-	-	-
710.7	3127	2453	ST 9					-	-	-	-	-	-	-
710.6	3127	2453	PT 10					-	-	-	-	-	-	-
710.6	3127	2453	ST 10					-	-	-	-	-	-	-
710.7	3127	2453	PT 11					-	-	-	-	-	-	-
710.7	3127	2453	ST 11					-	-	-	-	-	-	-
816.6	4001	2663	PT 14					-	-	-	-	-	-	-
816.6	4001	2663	ST 14					-	-	-	-	-	-	-
817.9	4001	2663	PT 15					-	-	-	-	-	-	-
817.9	4001	2663	ST 15					-	-	-	-	-	-	-
347.5	1740	569	PT 16				132.33	-	-	-	-	-	-	-
347.5	1740	569	ST 16				132.33	-	-	-	-	-	-	-

CONDITION		SUMMARY TABLE 6										
ITEMS	WEIGHT LONG TONS	VCG FT.	VERTICAL MOMENT TONS X FT.	LCG FT.	LONGL. MOMENT TONS X FT.		TCG FT.	TRANS. MOMENT TONS X FT.		FREE SURFACE M. TONS X FT.		
					+AFT	-FWD		-PORT	+STBD	LONGL.	TRANS.	
CONDITION AT	DRAFT											

L.C.B. →

Operational Lightweight											
Bulk & Sack Storage Table 2A											
Deck Loads (Solid) Table 2B											
Deck Loads (Liquid) Table 3											
Lower Hull (Fuel & D.W.) Table 4											
Total (Excluding Ballast)											

Required Ballast Table 5											
--------------------------	--	--	--	--	--	--	--	--	--	--	--

Total Displacement											
		VCG							45° Diag. F.S., Mom.		

LONGITUDINAL STABILITY	
VCG Vertical Centre of Gravity	FT
Free Surface Correction $\frac{F.S. Longl. Displacement}{\dots}$	FT
KG _L Vertical Centre of Gravity (Corrected) $\frac{By Addition}{\dots}$	FT

45° DIAGONAL STABILITY	
VCG Vertical Centre of Gravity	FT
Free Surface Correction $\frac{F.S. Diag. Displacement}{\dots}$	FT
KG _D Vertical Centre of Gravity (Corrected) $\frac{By Addition}{\dots}$	FT

At Ft. Mean Draft KG_L must not exceed . FT

KM _L Longitudinal Metacentre above Base	FT
KG _L Vertical Centre of Gravity - After Correction	FT
GM _L Longitudinal Metacentric Height (Corrected)	FT

At Ft. Mean Draft KG_D must not exceed . FT

KM _D Diagonal Metacentre above Base	FT
KG _D Vertical Centre of Gravity - After Correction	FT
GM _D Diagonal Metacentric Height (Corrected)	FT

CONDITION TRANSIT		SUMMARY TABLE 6 A										
ITEMS	WEIGHT LONG TONS	VCG FT.	VERTICAL MOMENT TONS X FT.	LCG FT.	LONGL. MOMENT TONS X FT.		TCG FT.	TRANS. MOMENT TONS X FT.		FREE SURFACE M. TONS X FT.		
					+AFT	-FWD		-PORT	+STBD	LONGL.	TRANS.	
CONDITION AT	DRAFT											

L.C.B. →

Operational Lightweight											
Bulk & Sack Storage Table 2A											
Deck Loads (Solid) Table 2B											
Deck Loads (Liquid) Table 3											
Ballast Table 5											
Total (EXCL. L. HULL FUEL & DRILL WATER)											

Lower Hull (Fuel & D.W.) Table 4											
----------------------------------	--	--	--	--	--	--	--	--	--	--	--

Total Displacement											
		VCG									

LONGITUDINAL STABILITY	
VCG (UNCORRECTED)	FT
FREE SURFACE CORR'N $\frac{L.S. Longl. MOM. Displacement}{\dots}$	FT
VCG (CORRECTED) KG _L $\frac{By Addition}{\dots}$	FT
At Ft. Mean Draft must not exceed	FT
KM _L Long'l Metacentre above $\frac{t}{2}$	FT
KG _L As Corrected	FT
GM _L Long'l Corr'd Metacentric Ht.	FT
Trim in degrees $\frac{L.S. Longl. MOM. Displacement}{\dots}$	

TRANSVERSE STABILITY	
VCG (UNCORRECTED)	FT
FREE SURFACE CORR'N $\frac{T.S. Trans. MOM. Displacement}{\dots}$	FT
VCG (CORRECTED) KG _T $\frac{By Addition}{\dots}$	FT
At Ft. Mean Draft must not exceed	FT
KM _T Trans. Metacentre above $\frac{t}{2}$	FT
KG _T As Corrected	FT
GM _T Trans. Corr'd Metacentric Ht.	FT

WEATHER DATA

APPENDIX B

APPENDIX E

WEATHER DATA	
1. TELEX REGARDING DEFINITION OF PARAMETERS IN SITE-SPECIFIC FORECASTS NORDCO Limited to Mobil Oil Canada Limited September 1, 1982. Exhibit #115.	239
2. SITE SPECIFIC WEATHER FORECASTS February 13 to 15, 1982 issued by NORDCO Limited to Mobil Oil Canada Limited. Extract from Exhibit #60.	240
3. GUIDE TO MARINE FORECASTS, NORDCO LIMITED January 1, 1980.	246
4. DESCRIPTION OF FEBRUARY 14-15, 1982 STORM Extracted from section 5.7 of "The Analysis of Weather Conditions experienced by the <i>Ocean Ranger</i> , November 1980 to February 15, 1982" Atmospheric Environment Services, Bedford, Nova Scotia.	247
5. WAVE DATA FROM THE ZAPATA UGLAND Station 140, February 14 to 16, 1982. Exhibit #119.	257
6. WEATHER OBSERVATIONS FOR FEBRUARY 14-15, 1982 From the <i>Zapata Uglan</i> d, <i>SEDCO 706</i> and <i>Ocean Ranger</i> Extract from Exhibit #117.	258

Item E-1
Telex Regarding Definition of Parameters in Site-Specific Forecasts

MOBIL HO SNF

'82 SEP -1 13:24

NORDCO SNF
SEPT 1 1982

MESSAGE NO 9028

MOBIL OIL CANADA
ST. JOHN'S

ATTN M. HASSEL

SUBJ: DEFINITION OF PARAMETERS IN SITE-SPECIFIC FORECASTS 173-81

1. DEFINITIONS GIVEN BELOW IN RESPONSE TO OUR TELECON THIS AM DO NOT HESITATE TO CONTACT ME IF I CAN BE OF FURTHER SERVICE.

2. WIND AT ANEMOMETER

DIRECTION AND SPEED: THE EXPECTED AVERAGE SPEED AND DIRECTION OF THE THREE ONE-MINUTE MEANS THAT WILL BE OBSERVED ON THE RIG ANEMOMETER, WHEN SHE IS AT OPERATING DRAFT AT THE VALID TIME T AND AT T - 3 AND T + 3 HOURS. THE ONE-MINUTE MEANS ARE THOSE THAT WILL BE RECORDED BY THE OBSERVER AND TRANSMITTED IN THE THREE HOURLY MANMAR OBSERVATION.

MAXIMUM SPEED: THE HIGHEST SINGLE WIND GUST ANTICIPATED AT THE RIG ANEMOMETER BETWEEN T - 3 AND T + 3 HOURS.

3. SEA WAVE

SIG HEIGHT: THE EXPECTED AVERAGE HEIGHT OF THE HIGHEST ONE-THIRD OF THE WAVES GENERATED BY THE WIND BLOWING AT THE SEA SURFACE IN THE VICINITY OF THE RIG AT THE VALID TIME.

MAX HEIGHT: AS FOR SIG HEIGHT, BUT THE AVERAGE HEIGHT OF THE HIGHEST ONE-HUNDRETH OF THE WAVES.

PERIOD: AVERAGE ZERO-CROSSING PERIOD OF THE WIND GENERATED WAVES.

4. SWELL WAVE:

DIRECTION: THE DIRECTION FROM WHICH THE PREDOMINANT SWELL TRAIN WILL ARRIVE

HEIGHT: THE EXPECTED AVERAGE HEIGHT OF THE HIGHEST ONE THIRD OF THE WAVES IN THE SWELL TRAIN.

PERIOD: THE AVERAGE ZERO-CROSSING PERIOD OF THE WAVES IN THE SWELL TRAIN

5. COMBINED SEA:

SIG HEIGHT: $\text{SQRT}((\text{SIG WAVE HEIGHT})^2 + (\text{SWELL HEIGHT})^2)$
USING THE ABOVE DEFINITIONS

MAX HEIGHT: $\text{SQRT}((\text{MAX WAVE HEIGHT})^2 + (\text{MAX SWELL HEIGHT})^2)$

WHERE MAX WAVE HEIGHT IS AS DEFINED ABOVE AND MAX SWELL HEIGHT IS THE AVERAGE HEIGHT OF THE HIGHEST ONE-HUNDRETH OF THE WAVES IN THE SWELL TRAIN

$\text{SQRT}(X)$ MEANS SQUARE ROOT OF X

X^N MEANS X RAISED TO POWER OF N

I WILL DELIVER TYPED COPY OF ABOVE SOONEST FOR CONFIRMATION

REGARDS

M. HEWSON
MOBIL HO SNF
NORDCO SNF

Item E-2
Site Specific Weather Forecasts for February 13-15, 1982

4095 MOBIL RDO SNF NORDCO WX SNF TIME OF ISSUE 13/0500Z									
FORECAST FOR THE OCEAN RANGER, SEDCO 706, AND ZAPATA UGLAND ISSUED BY NORDCO LIMITED FOR MOBIL OIL CANADA AT 0130 NST SATURDAY, FEB 13, 1982. VALID UNTIL 2030 NST SUNDAY WITH AN OUTLOOK FOR THE NEXT THREE DAYS.									
WARNINGS IN EFFECT. . . . GALE UPGRADED TO STORM, FREEZING SPRAY CONTINUE									
VALID TIME	13/12Z	13/18Z	14/00Z	14/12Z	14/18Z	15/00Z	2030	2030	2030
NST	0830	1430	0230	0830	1430	2030			
WIND	300	280	140	110	180	360			
DIRECTION	35	25	20	35	50	45			
SPEED	45	30	30	45	60	55			
MAX SPEED									
SEA WAVE	10	7	5	8	14	8			
SIG HEIGHT	17	12	9	14	24	14			
MAX HEIGHT	7	6	5	6	8	6			
PERIOD									
SWELL WAVE									
DIRECTION	NIL	330	280	270	140	180			
HEIGHT		5	4	5	6	10			
PERIOD		8	8	9	8	10			
SKY	BKN/OVC	.....	BKN/SCT	OVC	OVC/OBSCD				
AIR TEMP.	-5	-4	-1	0	+3	+2			
VSBY	6+ OCNL	5	6+	4	1-2 OCNL	1/4			
WEATHER	FEW SW -	.....	NIL	NIL	MIST	RW.F			
OUTLOOK VALID 00Z MONDAY TO 24Z WEDNESDAY									
MONDAY WIND NW 40-50 VSBY POOR/GOOD MCS 22 FT									
TUESDAY WIND NW BCMG W 20 VSBY GOOD MCS 18 FT									
WEDNESDAY WIND SW 30 BCMG NW 35 VSBY FAIR/GOOD MCS 14 FT									
SYNOPSIS:									
NORTHWEST GALE THIS MORNING IS FORECAST TO DEMINISH TO STRONG THIS AFTERNOON AND LIGHT THIS EVENING AS A HIGH PRESSURE CENTER AREA APPROACHES THE MOBIL DRILLING AREA.									
ON SUNDAY, A DEEP LOW CENTER IS FORECAST TO MOVE INTO THE AREA. AS A RESULT, STORM WARNING IS IN EFFECT. THE LOW IS CURRENTLY SOUTH OF CAPE HATTERAS.									
THE NEXT REGULAR FORECAST WILL BE ISSUED AT 13/1100Z									
WIND SPEED IN KNOTS, WAVE HEIGHTS IN FEET, PERIODS IN SECONDS, ALL DIRECTIONS IN DEGREES TRUE, VISIBILITY IN NAUTICAL MILES, TEMPERATURES IN CELSIUS.									
END									
MOBIL RDO SNF									
NORDCO WX SNF									
3216									

TIME OF ISSUE 13/1100Z									
FORECAST FOR THE OCEAN RANGER, SEDCO 706, AND ZAPATA UGLAND ISSUED BY NORDCO LIMITED FOR MOBIL OIL CANADA AT 0730 NST SATURDAY, FEB 13, 1982. VALID UNTIL 2030 NST SUNDAY WITH AN OUTLOOK FOR THE NEXT THREE DAYS.									
WARNINGS IN EFFECT. . . . 'S94.: FREEZING SPRAY CONTINUE									
VALID TIME	13/12Z	13/18Z	14/00Z	14/12Z	14/18Z	15/00Z	2030	2030	2030
NST	0830	1430	0230	0830	1430	2030			
WIND	300	280	140	110	180	360			
DIRECTION	35	25	30	45	50	45			
SPEED	45	30	40	55	60	55			
MAX SPEED									
SEA WAVE	10	7	7	12	14	8			
SIG HEIGHT	17	12	12	20	24	14			
MAX HEIGHT	7	6	3	8	8	6			
PERIOD									
SWELL WAVE									
DIRECTION	NIL	330	280	270	140	180			
HEIGHT		5	4	4	6	10			
PERIOD		8	8	9	8	10			
SKY	BKN/OVC	.....	BKN/SCT	OVC	OVC/OBSCD				
AIR TEMP.	-5	-4	-2	-1	+3	+2			
VSBY	6+ OCNL	5	6+	6+	4	1-2 OCNL	1/4		
WEATHER	FEW SW -	.....	NIL	NIL	MIST	RW.F			
OUTLOOK VALID 00Z MONDAY TO 24Z WEDNESDAY									
MONDAY WIND NW 40-50 VSBY POOR/GOOD MCS 25 FT									
TUESDAY WIND NW 30 BCMG W 20 VSBY GOOD MCS 18 FT									
WEDNESDAY WIND SW 30 BCMG NW 35 VSBY FAIR/GOOD MCS 14 FT									
SYNOPSIS:									
NORTHWEST GALE THIS MORNING IS FORECAST TO DEMINISH TO STRONG THIS AFTERNOON AND LIGHT THIS EVENING AS A HIGH PRESSURE CENTER AREA APPROACHES THE MOBIL DRILLING AREA.									
ON SUNDAY, A DEEP LOW CENTER IS FORECAST TO MOVE INTO THE AREA. AS A RESULT, STORM WARNING IS IN EFFECT. THE LOW IS CURRENTLY AROUND 200 N MILES EAST OF CAPE HATTERAS.									
503 3/5 4307)-4 0943:-5 28)) ?3 8"73									
MOBIL RDO SNF									
CORRECTION. . . . PLS READ IN WARNINGS. . . . STORM WARNING, FREEZING. . . THE LAST LINE. . . . THE NEXT REGULAR FCST WILL BE ISSUED AT 13/1700Z									
MOBIL RDO SNF									
NORDCO WX SNF									

TIME OF ISSUE 13/2300Z

FORECAST FOR THE OCEAN RANGER, SEDCO 706 AND ZAPATA UGLAND ISSUED BY NORDCO LIMITED FOR MOBIL OIL CANADA AT 1930 NST SATURDAY, FEBRUARY 13, 1982. VALID UNTIL 0830 NST MONDAY WITH AN OUTLOOK FOR THE NEXT THREE DAYS.

WARNINGS IN EFFECT.....STORM, WAVE AND FREEZING SPRAY.....

VALID TIME	14/00Z	14/06Z	14/12Z	14/18Z	15/00Z	15/06Z	15/12Z
NST	2030	0230	0830	1430	2030	0230	0830

WIND AT ANEMOMETER

DIRECTION	180	140	110	230	270	320	320
SPEED	10	35	50	55	45	60	45
MAX SPEED	15	45	65	70	55	75	55

SEA WAVE

SIG HEIGHT	2	6	11	13	17	22	28
MAX HEIGHT	3	18	19	22	29	39	35
PERIOD	4	5	8	9	9	18	9

SWELL

DIRECTION	300	300	NIL	NIL	NIL	NIL	NIL
HEIGHT	12	7					
PERIOD	9	10					

SKY	OVC	OVC	OBSCD	OCNL	OVC	OVC	OCNL	OCNL
AIR TEMP.	-6	-3	-1	+6	0	-3	-6	-6
VSBY	6+	6+	1-2	OCNL 1/8.	1-5	1-5	OCNL 3/8-1	3/8-1
WEATHER	NIL	NIL	S-/S	CHNG TO SW-	SW-	SW-/	SW-/	SW

R-/R OCNL R+
TRW AFTER 15Z
MIST, FOG PTCHS
OCNL LGT FRZG SPRAY

OUTLOOK VALID 12Z MONDAY TO 24Z WEDNESDAY

MON WIND NW 30-40 VSBY FAIR MCS 25 FT.
TUE WIND 25 BCMG N20 VSBY GOOD MCS 18 FT.
WED WIND SW 30 BCMG NW 35 VSBY FAIR MCS 15 FT.

SYNOPSIS:

A HIGH PRESSURE CELL CROSSING THE GRAND BANKS THIS EVENING WILL BRING LIGHT AND VARIABLE WINDS. A GALE CENTER CURRENTLY ESTIMATED AT 987 NB NEAR 39N 66W RACING NORTHEASTWARD AT 40 KNOTS IS FORECAST TO DEVELOP INTO A STORM CENTER OVERNIGHT AND PASS BETWEEN ST. JOHN'S AND THE DRILL AREA ABOUT NOON ON SUNDAY THEN CONTINUE INTO THE ATLANTIC. GALE FORCE SOUTHEAST WINDS EXPECTED TO SPREAD OVER THE DRILL AREA AROUND 14/06Z OR SHORTLY AFTERWARD THEN INCREASE TO STORM FORCE AFTER DAWN. THE ASSOCIATED WARM FRONT EXTENDING EASTWARD FROM THE CENTER IS FORECAST TO CROSS THE AREA TOWARD NOON WITH SNOW CHANGING TO RAIN AS IT DOES. A COLD FRONT TRAILING SOUTHWARD FROM THE STORM CENTER WILL SWEEP ACROSS THE AREA IN THE LATE AFTERNOON WITH GALE TO STORM FORCE WEST TO NORTHWEST WINDS, HEAVY SEAS, FLURRIES, AND FREEZING SPRAY ANTICIPATED SUNDAY NIGHT.

THE NEXT REGULAR FORECAST WILL BE ISSUED AT 14/0500Z

END

NORDCO WX SNF

NORDCO WX SNF

TIME OF ISSUE 14/0500Z

FORECAST FOR THE OCEAN RANGER, SEDCO 706 AND ZAPATA UGLAND ISSUED BY NORDCO LIMITED FOR MOBIL OIL CANADA AT 0130 NST SUNDAY, FEB 14, 1982 VALID UNTIL 2030 NST MONDAY. WITH AN OUTLOOK FOR THE NEXT THREE DAYS.

WARNINGS IN EFFECT.....STORM, WAVE AND FREEZING SPRAY

VALID TIME	14/12Z	14/18Z	15/00Z	15/06Z	15/12Z	15/18Z	16/00Z
NST	0830	1430	2030	0230	0830	1430	2030

WIND	140	230	270	300	320	310	300
DIRECTION	45	55	45	65	50	45	25
SPEED	55	70	55	80	65	50	35

SEA WAVE

SIG HEIGHT	6	12	14	20	25	22	14
MAX HEIGHT	10	20	24	34	43	37	24
PERIOD	5	7	8	10	11	10	8

SWELL WAVE

DIRECTION	NIL	180	140	NIL	NIL	NIL	010
HEIGHT		6	7				10
PERIOD		7	8				10

SKY	OBSCD/OVC.....	OVC	OVC	OCNL	OBSCD	OVC/BKN	.....
AIR TEMP.	-1	+6	0	-3	-4	-5	-6
VSBY	1-2	OCNL 1/8	1-5	1-5	OCNL 1/2	6+	OCNL 4
WEATHER	S-F	RW/F	RW-/SW-	SW-F	OCNL	SW-F	OCNL SW-

OUTLOOK VALID 00Z MONDAY TO 24Z WEDNESDAY

MONDAY WIND NW 30 BCMG SE 20 VSBY GOOD MCS 25 FT
TUESDAY WIND SW 20-30 VSBY GOOD/FAIR MCS 18 FT
WEDNESDAY WIND SW -NW 20-30 VSBY GOOD MCS 15 FT

SYNOPSIS:

A 987MB STORM CENTER WAS LOCATED NEAR 40N 65W AT 14/0000Z. THIS DEE P LOW CENTER IS RACING NORTHEAST AT 40 KNOTS AND FORECAST TO PASS BETWEEN ST. JOHN'S AND THE DRILLING AREA ABOUT 14/1800Z.

LIGHT SOUTHERLY WINDS AT 14/0300Z FROM THE MOBIL RIGS ARE FORECAST TO REACH GALE FORCE WINDS BY 14/1200Z. STORM, WAVE, AND FREEZING SPRAY WARNINGS ARE IN EFFECT.

WIND SPEED IN KNOTS, WAVE HEIGHTS IN FEET, PERIODS IN SECONDS, ALL DIRECTIONS IN DEGREES TRUE, VISIBILITY IN NAUTICAL MILES, TEMPERATURES IN CELSIUS.

END

MOBIL RDO SNF

NORDCO WX SNF

3216

3216

MOBIL DCK SNF

TIME OF ISSUE 14/1100Z

FORECAST FOR THE OCEAN RANGER, SEDCO 706 AND ZAPATA UGLAND ISSUED BY NORDCO LIMITED FOR MOBIL OIL CANADA AT 0730 NST SUNDAY, FEB 14, 1982 VALID UNTIL 2030 NST MONDAY, WITH AN OUTLOOK FOR THE NEXT THREE DAYS.

WARNINGS IN EFFECT...STORM, WAVE AND FREEZING SPRAY

VALID TIME NST	14/12Z 0830	14/18Z 1430	15/00Z 2030	15/06Z 0230	15/12Z 0830	15/18Z 1430	16/00Z 2030
WIND DIRECTION	140	180	300	280	270	310	300
SPEED	50	65	45	40	35	30	25
MAX SPEED	60	90	55	50	45	40	35
SEA WAVE	14	22	14	16	18	20	14
SIG HEIGHT	24	37	24	27	31	34	24
MAX HEIGHT	8	10	8	9	9	10	8
PERIOD							
SWELL WAVE DIRECTION	NIL	140	180	360	300	NIL	010
HEIGHT		10	16	10	10	10	10
PERIOD		9	10	10	10	10	10
SKY	OBSCD/OVC..		OVC	OVC OCNL	OBSCD	OVC/BKN	
AIR TEMP.	-1	+6	0	-3	-4	-5	-6
VSBY	1-2 OCNL	1/8	1-5	1-5 OCNL	1/2	6+ OCNL	4
WEATHER	S-F	RW,F	RW-/SW- RSK TRW	SW-F	OCNL SW-F	OCNL SW-F	OCNL SW-

OUTLOOK VALID 00Z MONDAY TO 24Z WEDNESDAY

MONDAY WIND NW 30 BCMG SE 20 VSBY GOOD MCS 25 FT
 TUESDAY WIND SW 20-30 VSBY GOOD/FAIR MCS 18 FT
 WEDNESDAY WIND SW -NW 20-30 VSBY GOOD MCS 15 FT

SYNOPSIS:

A 960MB STORM CENTER WAS LOCATED AT 44.5N 58.8W AT 14/0900Z. IT MOVING NORTHEAST AT 40 KNOTS. FORECAST POSITIONS ARE 46N 57W AND 49.5N 53W AT 14/1200Z AND 14/1800Z RESPECTIVELY. NOTE THE FORECAST TRAJECTORY OF THE LOW CENTER HAS BEEN AMENDED TO MORE NORTHERLY THAN THE PREVIOUS FORECAST, BUT DRASTIC DEEPENING OF THE PRESSURE CENTER WILL CREATE HIGHER WINDS AND WAVES EARLIER THAN EXPECTED IN THE PREVIOUS FORECAST. COLD FRONT ASSOCIATED WITH THIS STORM IS FORECAST TO PASS OVER THE RIGS SHORTLY AFTER 14/1800Z.

WIND SPEED IN KNOTS, WAVE HEIGHTS IN FEET, PERIODS IN SECONDS, ALL DIRECTIONS IN DEGREES TRUE, VISIBILITY IN NAUTICAL MILES, TEMPERATURES IN CELSIUS.

END

NORDCO WX SNF

MOBIL DCK SNF

ISSUE TIME 14/1700Z

FORECAST FOR THE SEDCO 706, ZAPATA UGLAND AND THE RANGER ISSUED BY NORDCO LIMITED FOR MOBIL OIL AT 1330 NST SUNDAY, FEBRUARY 14, 1982 VALID UNTIL 0830 NST TUESDAY WITH AN OUTLOOK FOR THE NEXT THREE DAYS.

WARNINGS IN EFFECT
 STORM, WAVE AND FREEZING SPRAY CONTINUED

VALID TIMES	15/00Z 2030	15/06Z 0230	15/12Z 0830	15/18Z 1430	16/00Z 2030	16/06Z 0230	16/12Z 0830
LCL TIMES							
WIND AT ANEMOMETER DIRECTION	280	310	340	330	330	350	330
SPEED	70	60	55	50	40	30	25
MAX SPEED	90	80	65	65	50	40	35
SEA WAVE	20	23	26	23	15	10	8
SIG HEIGHT	35	40	46	40	26	17	14
MAX HEIGHT	10	10	10	10	8	7	6
PERIOD							
SWELL WAVE DIRECTION	NIL	NIL	NIL	330	310	300	300
HEIGHT				16	20	20	15
PERIOD				9	10	9	9
SKY COVER	OVC VRBL	OBSCD	OVC	OVC	OVC/BKN		BKN
AIR	0	-3	-3	-5	-7	-8	-9
TEMPERATURE	1-5 VRBL	1/8-1/2	4-6	SW- OCNL SW	OCNL 3-5	OCNL SW	6+
VSBY	SW-/SW						NIL
WEATHER							

OUTLOOK VALID 12Z TUESDAY TO 24Z THURSDAY

TUE WIND NW 25 BECOMING SE 20, VSBY GOOD, MAXIMUM COMBINED WAVE 15
 THU WIND SW 20-30, VSBY FAIR, MAXIMUM COMBINED WAVE 15
 THU WIND SW-NW 20-30 VSBY GOOD, MAXIMUM COMBINED SEA 13

SYNOPSIS

960 MB STORM CENTER SOUTH OF AVALON PENINSULA AT 1200Z WILL MOVE NORTHEASTWARD RAPIDLY.

STORM FORCE NORTHWESTERLIES AND POOR VISIBILITIES AND ROUGH SEAS ARE EXPECTED TO PERSIST TONIGHT, DIMINISHING TO GALE FORCE WINDS AND IMPROVING VISIBILITIES TO FAIR DECREASING WAVE HEIGHTS BY MONDAY NOON.

WEATHER CONDITIONS WILL IMPROVE SUBSTANTIALLY WITH A RIDGE THAT WILL APPROACH THE DRILLING AREA BY MONDAY NIGHT OR EARLY TUESDAY MORNING.

THE NEXT REGULAR FORECAST WILL BE ISSUED AT 14/2300Z

WIND SPEED IN KNOTS, WAVE HEIGHTS IN FEET, PERIODS IN SECONDS, ALL DIRECTIONS IN DEGREES TRUE, VISIBILITY IN NAUTICAL MILES, TEMPERATURES IN CELSIUS.

END

MOBIL RDO SNF

NORDCO WX SNF

4895

MOBIL RDO SNF
NORDCO WX SNF

ISSUE TIME 14/2300Z

FORECAST FOR THE SEDCO 706, ZAPATA UGLAND AND THE RANGER ISSUED BY NORDCO LIMITED FOR MOBIL OIL CANADA AT 1930 NST SUNDAY, FEBRUARY 14, 1982 VALID UNTIL 0830 NST TUESDAY WITH AN OUTLOOK FOR THE NEXT THREE DAYS.

WARNINGS IN EFFECT STORM, WAVE AND FREEZING SPRAY CONTINUED

VALID TIMES 15/00Z 15/06Z 15/12Z 15/18Z 16/00Z 16/06Z 16/12Z 16/18Z

LCL TIMES 2030 0230 0630 1430 2030 0230 0830

WIND AT ANEMOMETER

DIRECTION 270

SPEED 75

MAXSPEED 90

SEA WAVE 25

SIG HEIGHT 44

MAX HEIGHT 9

PERIOD 10

SWELL WAVE 320

DIRECTION 15

HEIGHT 9

PERIOD 9

SKY OBSCD

AIR TEMP -2

VSBY 2-4 VRBL 1/8-1

WEATHER SW-/SW

FREEZING SPRAY

OUTLOOK VALID 12Z TUESDAY TO 24Z THURSDAY

TUE WIND SE 30-40 VSBY POOR MCS 16 FT.

WED WIND NW 30-40 VSBY FAIR MCS 20 FT.

THU WIND NE 20-30 VSBY POOR MCS 13 FT.

SYNOPSIS:

A COLD FRONT FROM A STORM CENTER, EAST OF THE AVALON PENINSULA ABOUT 2000Z, EXTENDING SOUTHWARD ALONG 50 W WILL LIE OVER THE RIGS BETWEEN 0100-0300Z. STORM FORCE NORTHWESTERLIES, POOR VISIBILITIES AND ROUGH SEAS WILL PERSIST TONIGHT

A RIDGE OF HIGH PRESSURE OVER QUEBEC WILL MOVE TO THE DRILLING AREA MONDAY NIGHT, MAINTAINING STRONG SOUTHWESTERLIES. GOOD VISIBILITIES AND SEAS 10-15 FEET MOSTLY FROM NORTHWESTERLY SWELLS.

A WARM TROUGH FROM A DEEPENING LOW MOVING TO SOUTHERN LABRADOR WILL EXTEND ALONG WESTERN NEWFOUNDLAND. THIS SYSTEM WILL BRING SOUTHWESTERLY GALES AND BY TUESDAY MORNING, FAIR TO POOR VISIBILITIES IN FOG AND RAIN/RAINFALLS AND INCREASING TEMPERATURES ARE EXPECTED ON TUESDAY.

WIND SPEED IN KNOTS, WAVE HEIGHTS IN FEET, PERIODS IN SECONDS, ALL DIRECTIONS IN DEGREES TRUE, VISIBILITY IN NAUTICAL MILES, TEMPERATURES IN CELSIUS.

END

MOBIL RDO SNF

MOBIL RDO SNF

NORDCO WX SNF

TIME OF ISSUE 15/0500Z

FORECAST FOR THE OCEAN RANGER, SEDCO 706, AND ZAPATA UGLAND ISSUED BY NORDCO LIMITED FOR MOBIL OIL CANADA AT 0130 NST MONDAY, FEB 15, 1982 VALID UNTIL 2030 NST TUESDAY WITH AN OUTLOOK FOR THE NEXT THREE DAYS.

WARNINGS IN EFFECT...STORM, WAVE, AND FREEZING SPRAY

VALID TIME 15/12Z 15/18Z 16/00Z 16/06Z 16/12Z 16/18Z 17/00Z

NST 0830 1430 2030 0230 0830 1430 2030

WIND 300

DIRECTION 290

SPEED 58

MAX SPEED 75

SEA WAVE 30

SIG HEIGHT 54

MAX HEIGHT 10

PERIOD 10

SWELL WAVE NIL

DIRECTION NIL

HEIGHT NIL

PERIOD NIL

SKY OVC

AIR TEMP. -8

VSBY 6 OCNL 1-4

WEATHER OCNL SW -

FREEZING SPRAY MODERATE TO HEAVY

OUTLOOK VALID 0000Z WEDNESDAY TO 2400Z FRIDAY

WEDNESDAY WIND NW 30-45 VSBY FAIR/GOOD MCS 20 FT

THURSDAY WIND NW TO NE 20-30 VSBY GOOD/FAIR MCS 15 FT

FRIDAY WIND NW 30-40 VSBY FAIR/GOOD MCS 20 FT

SYNOPSIS:

A MAJOR WINTER STORM CURRENTLY ESTIMATED AT 953MB NEAR 50N 49W IS FORECAST TO CONTINUE NORTHEASTWARD TOWARD GREENLAND WATERS. STORM FORCE WINDS EXTEND ABOUT 400 MILES FROM THE CENTER AND GALE FORCE WINDS ABOUT 600 MILES. STORM FORCE WINDS GRADUALLY DECREASING TO GALE FORCE THIS EVENING AT THE DRILL SITES. VERY HEAVY SEAS LOWERING SLOWLY THIS AFTERNOON. FREEZING SPRAY CONTINUING THRU THE PERIOD. A RIDGE WILL CROSS THE GRAND BANKS TUESDAY MORNING, A TROUGH OF LOW PRESSURE FOLLOWING BEHIND THE RIDGE WILL REACH THE DRILL AREA TUESDAY EVENING.

WIND SPEED IN KNOTS, WAVE HEIGHTS IN FEET, PERIODS IN SECONDS, ALL DIRECTIONS IN DEGREES TRUE, VISIBILITY IN NAUTICAL MILES, TEMPERATURES IN CELSIUS.

END

MOBIL RDO SNF

NORDCO WX SNF

TIME OF ISSUE 15/0730Z

UPDATE FORECAST FOR THE MOBIL DRILLING AREA ISSUED BY NORDCO LTD. FOR MOBIL OIL CANADA AT 0400 NST MONDAY, FEBRUARY 15, 1982 VALID UNTIL 1430 NST TODAY.

WARNINGS IN EFFECT...STORM, WAVE AND FREEZING SPRAY CONTINUED..

VALID TIME 15/08Z 15/12Z 15/15Z 15/18Z
LCL TIME 0530 0830 1130 1430

WIND AT ANEMOMETER 310 290
DIRECTION 310 310 310 290
SPEED 60 58 53 45
MAX SPEED 75 70 63 55
SEA WAVE 30 30 23 20
SIG HEIGHT 54 50 42 35
MAX HEIGHT 11 11 10 10
PERIOD

SWELL WAVE NIL EXPECTED
SKY OBSCD OVC OVC BKN OCNL OVC
VSBY 1/2-2 6 OCNL 1-4..... 6 OCNL 3-5
WEATHER S-/SW- OCNL SW-..... FEW SW-

FREEZING SPRAY MODERATE TO HEAVY FREEZING SPRAY.....
AIR TEMP -6 -8 -10 -8

THE NEXT REGULAR FORECAST WILL BE ISSUED AT 15/1100Z

END

MOBIL RDO SNF

NORDCO SNF

SEDCO706 SNF

NORDCO WX SNF

ISSUE TIME 15/1030Z

FORECAST FOR THE SEDCO 706, ZAPATA UGLAND AND OCEAN RANGER ISSUED BY NORDCO LTD. FOR MOBIL OIL CANADA AT 0700 NST MONDAY, FEBRUARY 15, 1982 VALID UNTIL 0830 TUESDAY WITH AN OUTLOOK FOR THE NEXT THREE DAYS

WARNINGS IN EFFECT...STORM WAVE AND FREEZING SPRAY WARNINGS CONTINUED..

VALID TIME 15/12Z 15/15Z 15/18Z 15/21Z 16/00Z 16/06Z 16/12Z 16/18Z 17/00Z
NST 0830 1130 1430 1730 2030 0230 0830 1430 2030

WIND 290 300 300 300 300 260 210 150 240
DIRECTION 290 300 300 300 300 260 210 150 240
SPEED 50 50 48 48 45 25 30 35 35
MAX SPEED 65 65 60 60 55 35 40 45 45

SEA WAVE 26 28 25 25 23 5 7 8 11
SIG HT 45 48 43 43 39 9 12 12 19
MAX HT 12 12 11 11 11 5 5 6 7
PERIOD

SWELL WAVE NIL NIL NIL NIL NIL 310 310 310 NIL
DIRECTION NIL NIL NIL NIL NIL 310 310 310 NIL
HEIGHT 19 16 9
PERIOD 11 11 10
SKY OVC..... BKN..... OVC OCNL OBSCD.....

AIR -7 -8 -7 -6 -6 -4 -2 -1 +2
TEMP 1-4..... 6 OCNL 2-5..... 6+ 6 1-5 OCNL
VSBY 3/8-1..... FEW SW- NIL S- OCNL S

WEATHER SW-..... OCNL SW-..... FEW SW- NIL S- OCNL S
FRZG MODERATE TO HEAVY..... LGT TO MDT.....
SPRAY

OUTLOOK VALID 00Z WEDNESDAY TO 24Z FRIDAY
WEDNESDAY WIND NW 30-45 VSBY FAIR/GOOD MCS 20 FT
THURSDAY WIND NW TO NE 20-30 VSBY GOOD/FAIR MCS 15 FT
FRIDAY WIND NW 30-40 VSBY..FAIR/GOOD MCS 20 FT

SYNOPSIS:

INTENSE WINTER STORM CURRENTLY ESTIMATED AT 953 MB NEAR 50.5N 45.0W IS EXPECTED TO MOVE GENERALLY NORTHEASTWARD AWAY FROM THE DRILL AREA TODAY. AS A CONSEQUENCE, STORM FORCE WESTERLY WINDS REPORTED FROM THE RIGS SHORTLY BEFORE FORECAST TIME THIS MORNING WILL DECREASE SLOWLY THRU THE DAY. HEAVY SEA LOWERING ONLY VERY SLOWLY TODAY. COLD TEMPERATURES COMBINED WITH THE WINDS WILL GIVE MODERATE TO HEAVY FREEZING SPRAY. VISIBILITY FAIR IN SNOW OR SNOW FLURRIES IMPROVING TO GENERALLY GOOD THIS AFTERNOON.

THE NEXT FORECAST WILL BE ISSUED AT 15/1330Z

WIND SPEED IN KNOTS, WAVE HEIGHTS IN FEET, PERIODS IN SECONDS, ALL DIRECTIONS IN DEGREES TRUE, VISIBILITY IN NAUTICAL MILES, TEMPERATURES IN CELSIUS.

END

SEDCO706 SNF

NORDCO WX SNF

4684
 SEDCO 706 SNF
 NORDCO NX SNF
 ISSUE TIME 15/1330 Z

UPDATE FORECAST FOR THE OCEAN RANGER, SEDCO 706 AND ZAPATA UGLAND
 ISSUED BY NORDCO LIMITED, ST. JOHN'S AT 0930 NST: MONDAY FEB. 15, 1982.

SRORM WAVE AND FREEZING SPRAY WARNINGS CONTINUED

REASON FOR UPDATE

1200Z SATELLITE PHOTO SHOWS STORM CENTER NEAR 50.8N 43.9W AND MOVING
 EAST-NORTHEAST AT ABOUT 17 KNOTS. EXTENSIVE CLOUD BAND FROM THE CENTER
 OF THE LOW EXTENDS WEST TO NEWFOUNDLAND EAST COAST AND ALONG AVALON
 PENINSULA WITH NO BREAKS OBSERVED. LITTLE CHANGE FROM PREVIOUS FORE-
 CAST OF 1030Z EXPECTED AT THIS HOUR.

VALID TIME	15/15Z	15/18Z	15/21Z	16/00Z
WIND	300	300	300	300
DIRECTION	50	46	44	42
SPEED	65	60	55	55
MAX SPEED				

SEA WAVE	28	27	26	24
SIG HEIGHT	50	49	47	43
MAX HEIGHT	12	12	12	12
PERIOD				

SKY OVC VRBL OBSCD.....

AIR TEMP.	-7	-7	-8	-8
VSBY	1/2 VRBL	3.....		

WEATHER S - /S FOG CHNG SW - /SW.....

HEAVY FREEZING SPRAY THRUT.....

THE NEXT REGULAR FORECAST WILL BE ISSUED AT 15/1700Z

END
 SEDCO 706 SNF
 NORDCO NX SNF
 MOBIL RDO SNF
 NORDCO NX SNF

PLEASE ADD TO UPDATE FORECAST ISSUED AT 15/1330Z

VALID TIME	15/15Z	15/18Z	15/21Z	16/00Z
SEA WAVE				
SIG HEIGHT	28	27	26	24
MAX HEIGHT	50	49	47	43
PERIOD	12	12	12	12

END
 NORDCO NX SNF

Item E-3
Guide to Marine Forecasts
NORDCO Limited

January 1, 1980

GENERAL

WIND DIRECTIONS IN DEGREES TRUE
 WIND SPEEDS IN KNOTS
 SYSTEM MOTION SPEEDS IN KNOTS
 WAVE HEIGHTS IN FEET
 WAVE PERIODS IN SECONDS
 TEMPERATURES IN DEGREES CELSIUS
 VISIBILITIES IN NAUTICAL MILES

WIND CRITERIA

LIGHT – SPEEDS 0 TO 11 KNOTS
 MODERATE – 12 TO 19 KNOTS
 STRONG – 20 TO 34 KNOTS
 GALE – 35 TO 47 KNOTS
 STORM – 48 KNOTS AND GREATER

NOTE: GALE AND STORM WARNINGS ARE ISSUED WHEN THE MEAN WINDS ARE EXPECTED IN THE APPROPRIATE CATEGORIES.

VISIBILITY CRITERIA

POOR – ZERO TO 1 MILE
 FAIR – MORE THAN 1 MILE BUT LESS THAN 6 MILES
 GOOD – 6 MILES OR MORE

ICING DUE TO FREEZING SPRAY

LIGHT – 1 TO 3 CM PER 24 HR.
 MODERATE – 4 TO 6 CM PER 24 HR. (WARNING ISSUED)
 HEAVY – 7 TO 14 CM PER 24 HR.
 VERY HEAVY – 15 CM OR GREATER PER 24 HR.

WEATHER ABBREVIATIONS

R – RAIN	IP – ICE PELLETS
RW – RAINSHOWER(S)	IPW – ICE PELLET SHOWER(S)
TRW – THUNDERSHOWER(S)	SP – SNOW PELLETS
S – SNOW	A – HAIL
SW – SNOWSHOWER(S)	M – MIST
L – DRIZZLE	F – FOG
ZR – FREEZING RAIN	H – HAZE
ZL – FREEZING DRIZZLE	

PRECIPITATION QUALIFIERS

(-) LIGHT
 () MODERATE
 (+) HEAVY

SKY COVER TERMINOLOGY

CLR – CLEAR	The sky condition when no cloud or obscuring phenomena is present.
-X- PARTIALLY OBSCURED	A surface based layer with a summation opacity of at least 1/10 but less than 10/10.
X – OBSCURED	A surface based layer with a summation opacity of 10/10
SCT – SCATTERED	A layer aloft with a summation amount of 5/10 or less.
BKN – BROKEN	A layer aloft with a summation amount of 6/10 to 9/10 inclusive.
OVC – OVERCAST	A layer aloft with a summation amount of 10/10.

INTERPRETATION OF OUTLOOK FORECAST

The outlook forecasts focus on the 6 to 12 hour period of each day during which the wind is expected to be the strongest and subsequently for that period the following parameters are forecast – the average wind speed and direction, the prevailing visibility and the combined sea state.

Item E-4 Description of February 14-15, 1982 Storm

This storm was first identified on the surface chart at the Atlantic Weather Centre in Bedford, Nova Scotia on February 12th as a weak disturbance in the Gulf of Mexico. The disturbance moved off the coast of Georgia and developed as it moved northward following the track shown in Figure 1. By 14/0000Z¹ the low had moved to about 210 nautical miles (nmi) south of Halifax. The low then began to intensify rapidly and moved toward the Avalon Peninsula at a speed of 35 knots passing near St. John's, Newfoundland at 1800Z. The low then continued to move northeastward with little or no deepening. By 0000Z on February 15 the low was located about 180 nmi northeast of St. John's. The Surface Analyses (Figures 2-7) plot the movement of this low pressure system from 0000Z, February 13 to 1200Z, February 15, 1982.

Winds from this storm began to affect the Hibernia area about 14/0600Z. They continued from the southeast at 30 to 50 knots until shifting to the southwest and increasing at about 14/1600Z. The strongest winds reported by drill rigs on the Hibernia field were the southwest winds between approximately 14/1600Z and 15/0600Z. At this time the low was passing to the northwest of the drill site. A maximum wind of 78 knots with gusts to 91 was reported by the SEDCO 706, located about 10 nmi northeast of the *Ocean Ranger*.

As the low moved northeastward into the North Atlantic the winds veered to the west or northwest and diminished slightly. West gales persisted in the area until approximately 0900Z on the 16th.

Sea states reported in weather observations for this storm were the highest recorded by the *Ocean Ranger* since it began reporting from Newfoundland waters in November 1980. The maximum state was a sea of 10 metres combined with a swell of 7 metres. This was at 15/0300Z, the last report received from the drill rig.

A more detailed meteorological discussion of the life cycle and dynamics of this storm is included in the "Detailed Analysis of the February 14-15, 1982 Storm" section of this report.

TRACKS OF MAJOR STORMS AND SUMMARY

The tracks of the major low pressure systems in the vicinity of the *Ocean Ranger* and of the storm during which the *Ocean Ranger* sank are shown in Figure 1. These storms all produced winds at the *Ocean Ranger* site in excess of 55 knots. The durations of strong winds and the maximum winds and sea states reported in the synoptic and intermediate synoptic weather observations at the *Ocean Ranger* site during these major storms are summarized in Table 1. The last column in this table shows the maximum combined wave height reported in these weather observations. It should be noted that combined wave heights are a function of other factors in addition to wind speed, e.g., wind duration, fetch, swell waves from remote storms and water depth. Thus, in most cases, there is not a one-to-one correlation between wind speed and wave height. With the exception of the September storm (Storm #3), these storms all occurred in the winter months of December, January and February – the time of year when the greatest north-south thermal contrast in the atmosphere occurs and when extra-tropical cyclonic activity is, in consequence, usually most intense. The storms generally moved in a northeasterly direction from their origin over the continent or the warm waters of the Gulf Stream.

In addition to eight cyclones there are numerous examples from other years of intense disturbances, strong winds and high seas over the Grand Banks (e.g., hurricane GEORGES of September 8, 1980). The marine archives have been searched for a small area centred at 46.8N 48.8W for examples of wind reports in excess of 63 knots in the Hibernia area. These examples are listed in Table 5. From examination of storm tracks (Figure 1) and the data in Table 2, it is apparent that the storm of February 14-15, 1982 was not an exceptional occurrence in this area of the world.

The storm of February 14-15, 1982 over the Grand Banks was a severe one. However, the storm track information (Figure 1), the extreme wind data in Tables 1 and 4 and other available data suggest that this storm was typical of severe winter storms over the Grand Banks. The evidence shows that storms of comparable severity have occurred in the past and probably can be expected in the future.

OCEAN RANGER STORM DESCRIPTION DETAILED ANALYSIS OF FEBRUARY 14-15, 1982 STORM

The storm which brought hurricane force winds to the Grand Banks area off Newfoundland on February 14th and 15th was first analysed by meteorologists at the Atmospheric Environment Services's Atlantic Weather Centre and Newfoundland Weather Office when it was a weak disturbance in the Gulf of Mexico on February 12th. This weak disturbance moved off the coast of southern Georgia that evening. An area of weak positive vorticity advection (PVA)² was just to the northwest of the low centre. Cold air advection at low levels behind the disturbance, a cross contour component of the 500 millibars (mb) winds and a favourable location of the low with respect to a strong 250 mb jet all suggested that this disturbance should develop.

By 13/1200Z the low had deepened to 1002 mb. At this time the 500 mb short wave trough had taken on a northwest to southeast orientation about 4 degrees of latitude behind the surface low, with the southeastern portion of the PVA now over the surface low position. The 1000 to 500 mb thickness ridge started to amplify and lay midway between the 500 mb trough and ridge. A 150 knot jet maximum³ had developed just east of Boston and the surface low was situated under a west-southwest flow of 120 knots in the right entrance area of the jet stream core.

At 14/0000Z the central pressure of the low was 984 mb and it had moved to 210 nmi south of Halifax. By 14/1200Z the low was located just south of St. Pierre-Miquelon. The low had moved to the north side of the jet stream axis and the 500 mb trough was beginning to close off. The thickness ridge was just east of the 500 mb trough and had reached its maximum amplitude. After this time the thermal ridge occluded from the low. The low continued to deepen for about the next 6 hours due almost exclusively to 500 mb height falls.

By 14/1800Z the low was located near St. John's. The central pressure at this time was about 954 mb. This was about the maximum stage of development of the low and after this time the low moved northeastward at a speed of 25 to 30 knots with little deepening or filling taking place.

The detailed sequence of meteorological events during February 14th and 15th at the three rigs in the Hibernia area is graphed in

Figures 8 to 13. Data for these plots was extracted from the coded weather observations received at the Newfoundland Weather Office and observations recorded in the log books of the *SEDCO 706* and the *Zapata Uglund*.

A frontal system which occluded from the low south of Nova Scotia moved east-northeast faster than the motion of the low itself. A trough of warm air aloft (trowal) extending northward from the frontal wave passed over the *Ocean Ranger* between 1500Z and 1600Z. At this time (see Figure 9) the southeast winds gradually veered from south to west as the low moved away to the northeast. They steadily increased in speed reaching a maximum at about 14/2100Z then diminished slightly after 15/0000Z. Temperatures increased to about 4°C in the southerly winds then fell gradually as winds changed to westerly. Breaks in the cloud cover were reported by all three drilling rigs as a narrow clear area (dry slot) moved over the area. The dry slot was between the thick cloud associated with the trowal and low level circulation cloud.

After about 15/0300Z the winds stabilized to a westerly direction and slowly diminished in strength, although gale force winds persisted until about 0900Z on February 16th. Circulation-induced unstable cumulus, or towering cumulus, formed over water in the cold westerly flow in the wake of the storm.

Precipitation in the form of heavy snow began at the *Ocean Ranger* at 14/0900Z. As temperatures rose the snow changed to moderate rain at 14/1400Z. Rain and fog continued throughout the day then reverted to snow later in the afternoon as temperatures fell below the freezing point. Light freezing rain was reported (on 15/0000Z) by the *Ocean Ranger* during the transition period.

After 15/0000Z the predominant restriction to ceiling and visibility was snow, although rain mixed with the snow was reported at the *Zapata Uglund* until 0730Z. Snow of varying intensity (and thus variable visibility) continued throughout the day on February 15th until it ended at approximately 0300 – 0600Z on February 16th. The time series of ceilings and visibilities in Figures 12 and 13 show that on February 15th the cloud ceiling varied between 300 and 1000 feet. Cloud ceilings and visibilities reported in the area were also low during

the period from about 14/1900Z until the disappearance of the rig.

Any snow which accumulated on the rigs before 14/1400Z would likely have melted during the 5 to 6 succeeding hours of above freezing temperatures and rain. It is not likely that there was much accumulation of freezing rain as it was not reported by either the *Zapata Uglund* or the *SEDCO 706* and the time frame during which freezing rain could have occurred was quite short.

Using the criteria for freezing spray of Table 3, weather conditions after 15/0000Z at the *Ocean Ranger* were favourable for the occurrence of freezing spray. Various studies have been done relating the rate of vessel icing to meteorological and sea state parameters (see for example Comiskey [1976], Shellard [1974], Stallabrass [1980], Kachurin et al [1974]). Using the combination of wind speed, air and sea surface temperatures observed at the *Ocean Ranger* at 15/0300Z the nomograms⁴ of Comiskey [1976] and Shellard [1974] both predict heavy to very heavy icing. Since icing rate or severity is highly dependent on vessel shape and speed (Stallabrass [1980]) it is impossible under the confines of the AES examination, to make a reliable quantitative estimate of icing rates on the *Ocean Ranger* from the physical data alone. The other rigs in the area (*SEDCO 706* and *Zapata Uglund*) were exposed to similar environmental conditions (see Figures 8-13). It is suggested that freezing spray conditions (if any) observed on these drilling rigs would be similar to that on the *Ocean Ranger*.

¹When indicating dates and times in its reports, AES uses the standard format of "day/time Zulu" with Zulu time (Greenwich Mean Time) being local time plus 3½ hours i.e. 14/0600Z reads 0600 Zulu on Feb. 14.

²PVA is the rate of increase in counterclockwise rotation of the atmosphere in the vicinity of a storm, due to transport of rotating air by upstream air currents; essential for the development or intensification of storms.

³A "jet stream" is relatively strong winds concentrated within a narrow stream in the atmosphere. A MAXIMUM JET is the maximum wind speed that occurs in a jet stream.

⁴Graphical presentation of relations between quantities whereby value of one may be found by simple geometrical construction from those of others.

REFERENCES

1. Comiskey, A. (1976): "Vessel Icing – Know When to Expect It", Alaska Seas and Coasts, Vol. 4, No. 5, December 1976.
2. Kachurin, L.G., L.I. Gashin, I.A. Smirnov (1974); Icing Rate of Small Displacement Fishing Boats under Various Hydrometeorological Conditions, Moscow, Meteorologiya i Gidrologiya, No. 3 (Tr.).
3. Shellard, H.C. (1974): Meteorological Aspects of Ice Accretion on Ships, Marine Science Affairs Report No. 10, W.M.O. Bulletin 397.
4. Smith, S.D. (1981): Factors for Adjustment of Wind Speed over Water to a 10 Metre Height. Report Series/BI-R-81-3/March 1981, Bedford Institute of Oceanography, Dartmouth, N.S.
5. Stallabrass, T.R. (1980): Trawler Icing, A Compilation of Work Done at N.R.C., National Research Council of Canada, Mechanical Engineering Report MD-56, N.R.C. No. 19372, Ottawa.

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TABLES

Duration of Strong Winds, Maximum Winds and Sea States observed at the <i>Ocean Ranger</i> during nine severe storms over the Grand Banks of Newfoundland	1	4
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* From original report

TABLE 1 Duration of strong winds, maximum winds and combined wave heights from weather reports of the *Ocean Ranger* during nine severe storms over the Grand Banks of Newfoundland.

Storm**	Duration (in hours) of		Maximum Wind (kts.)	Maximum Wave Height (m)
	Gales (≥34 kts.)	Storms (≥48 kts.)		
Storm #1	27	18	56	6.5
Storm #2	21	3	56	5.5
Storm #3	51	21	61	7.0
Storm #4	12	3	65	6.7
Storm #5,6	48	39	67	9.0
Storm #7	72	30	56	9.0
Storm #8	18	6	56	6.5
<i>Ocean Ranger</i> storm	n/a (48)*	n/a (33)*	72 (78)*	12.2 (12.0)*

* Bracketed values are from observations of the *Zapata Uglund* (47.0°N 48.8°W)

** Storm #1 – November 28, 1980

Storm #2 – December 14, 1980

Storm #3 – September 27, 1981

Storm #4 – January 10, 1982

Storm #5, 6 and 7 – January 15-20, 1982

Storm #8 – February 7, 1982

The *Ocean Ranger* Storm – February 14-15, 1982

TABLE 2 Number of days that wind exceeded a given threshold at the *Ocean Ranger*, November 8, 1980 – February 15, 1982.

CATEGORY	NO. OF DAYS	PERCENT OF TOTAL
≥34 kts. (gale force)	197	42.4 %
≥48 kts. (storm force)	43	9.2 %
≥56 kts. (violent storm force)	13	2.8 %
≥64 kts. (hurricane force)	4	0.9 %

TABLE 3 Combined Frequency of Occurrence of Temperatures ≤ -2°C and Winds ≥22 Knots at the *Ocean Ranger*

Month	Year	Percent of Time
December	1980	10.1 %
January	1981	4.4 %
February	1981	8.0 %
March	1981	0.4 %
April	1981	0.8 %
December	1981	6.0 %
January	1982	17.7 %
February*	1982	32.7 %

*Based on February 1-15 only.

Note: When temperatures fall below -2°C and winds exceed 11 m sec⁻¹ (11 metres per second or 22 knots) the occurrence of freezing spray is possible. Weather conditions reported by the *Ocean Ranger* were analyzed to determine the percentage of time during which this condition existed in the vicinity of the rig.

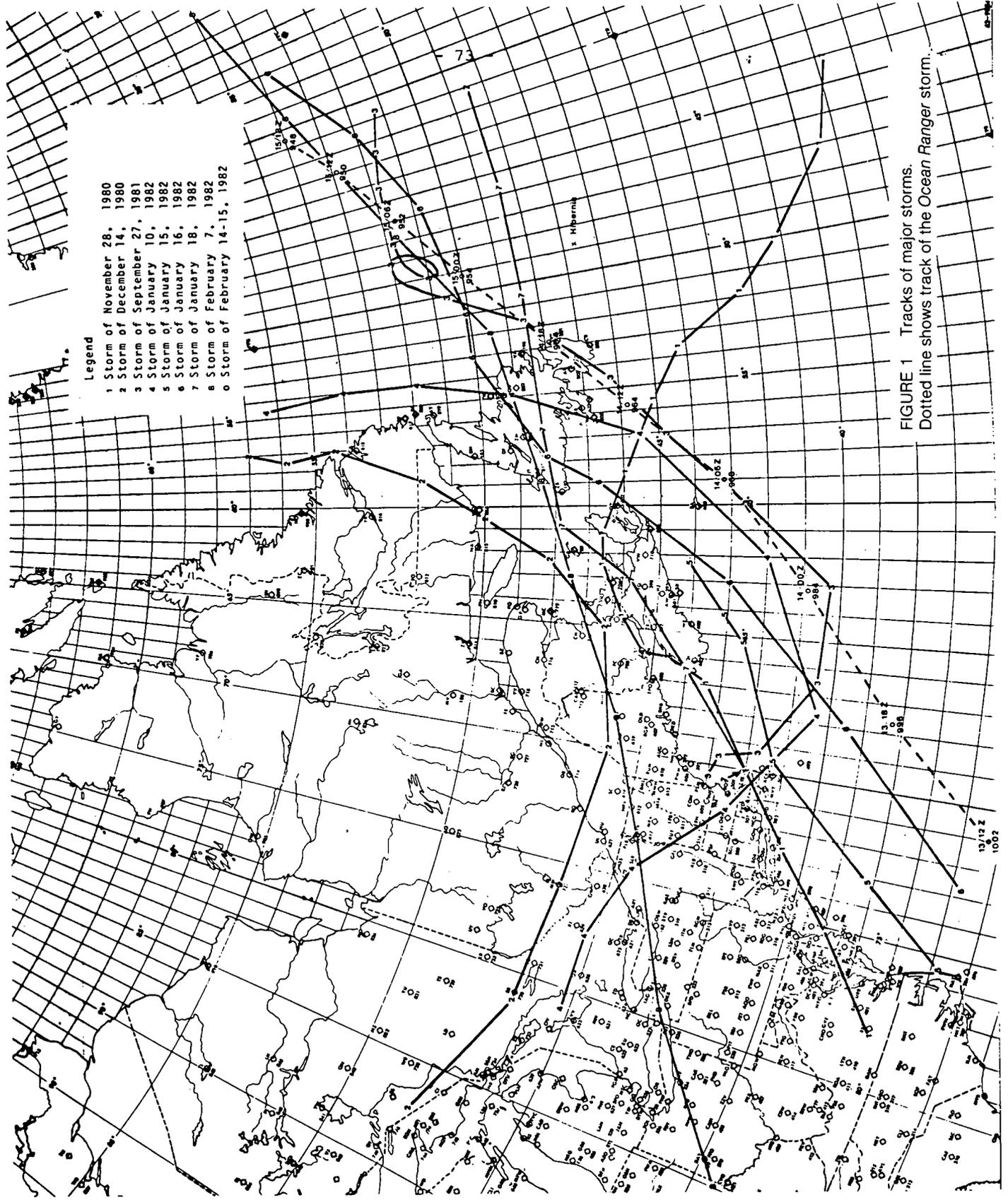
TABLE 4 Examples of observations of wind speed exceeding 63 knots over the Hibernia area*, 1960-1979.

DATE	TIME	WIND	
		DIRECTION	SPEED (KNOTS)
Oct. 28, 1973 (+)	1200Z	310	86
Feb. 5, 1976	1800Z	040	74
Nov. 30, 1974 (+)	0000Z	040	70
Nov. 24, 1973 (+)	0600Z	360	70
Dec. 28, 1972 (+)	1800Z	200	70
Feb. 16, 1966	1200Z	290	68
Feb. 16, 1966	1500Z	290	68
Feb. 16, 1966	1800Z	290	68
Nov. 24, 1973 (+)	0000Z	340	66
Dec. 26, 1974	1800Z	360	65
Oct. 22, 1973 (+)	1200Z	360	65
Jan. 3, 1975	0000Z	160	64

*Hibernia area is enclosed by the following Latitude – Longitude Pairs:

45.8N 48.0W 47.8N 49.7W
 45.8N 49.7W 47.8N 48.0W
 46.8N 50.2W 46.8N 47.4W

(+) Oil Rig Observations



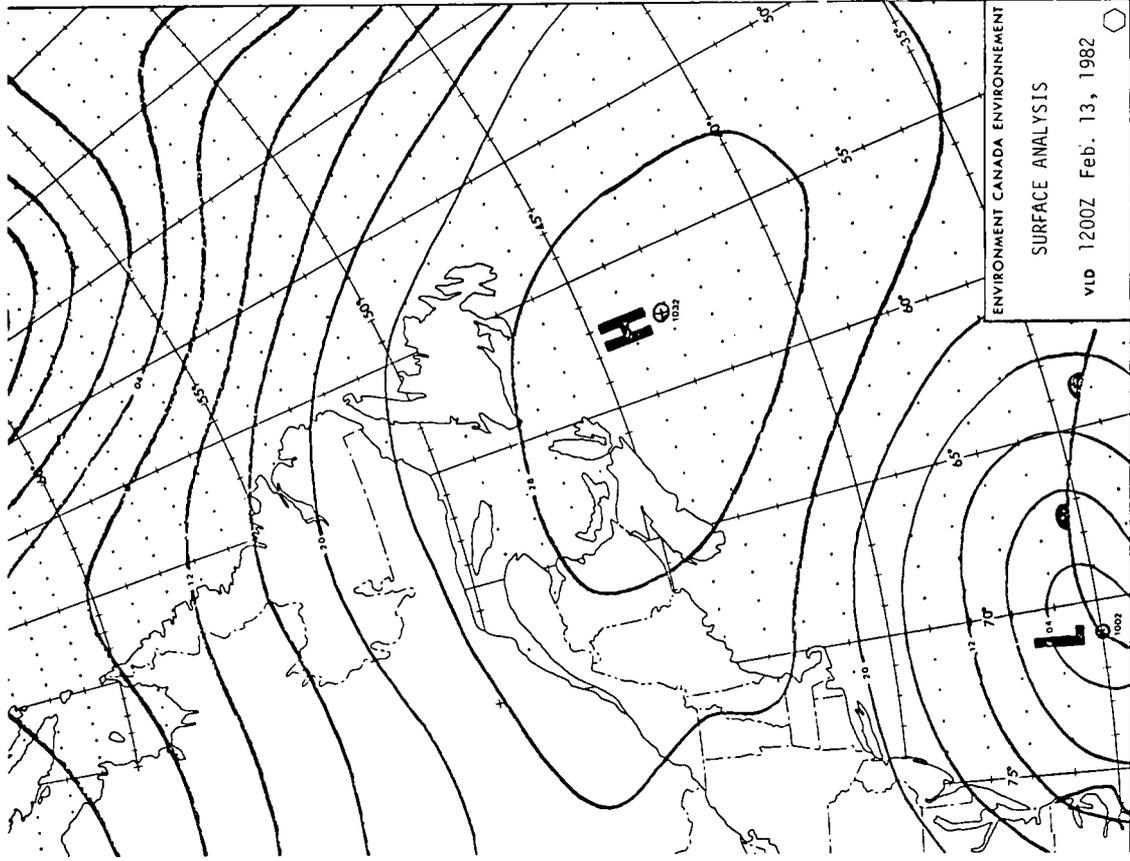


FIGURE 3

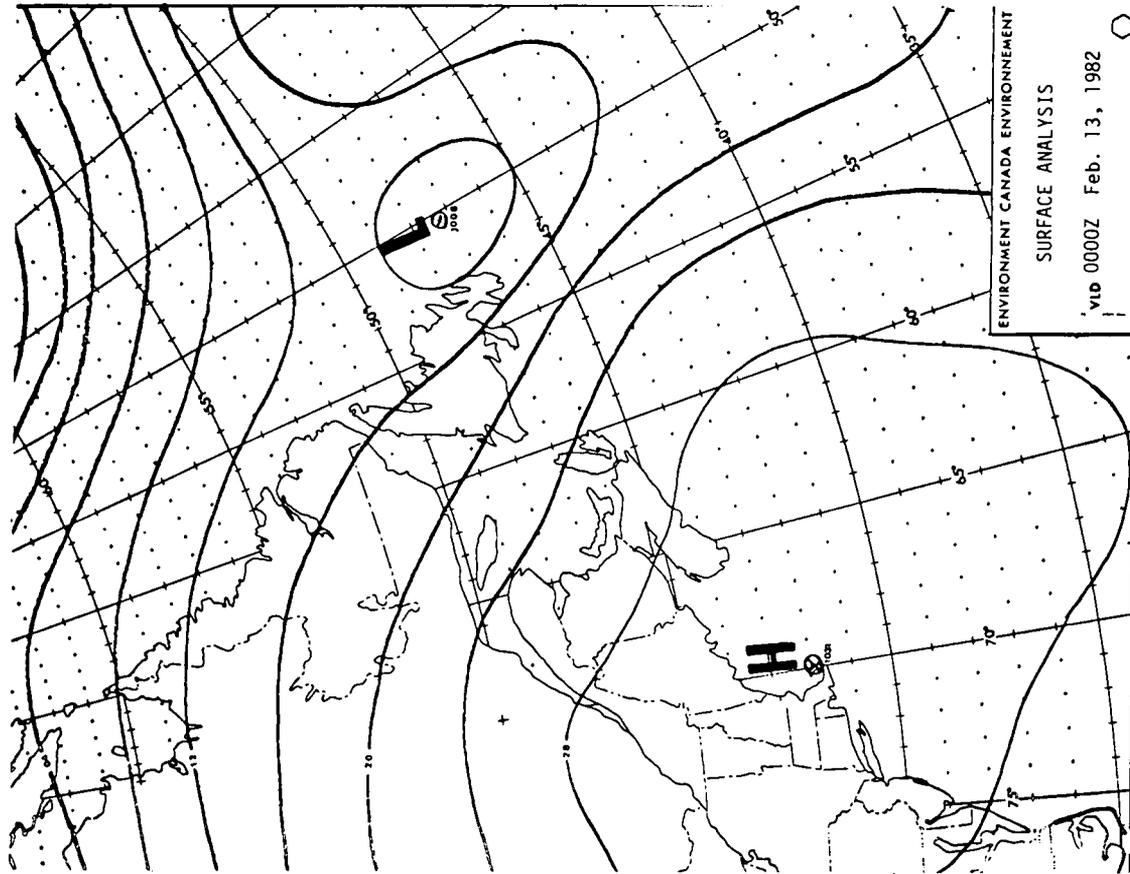


FIGURE 2

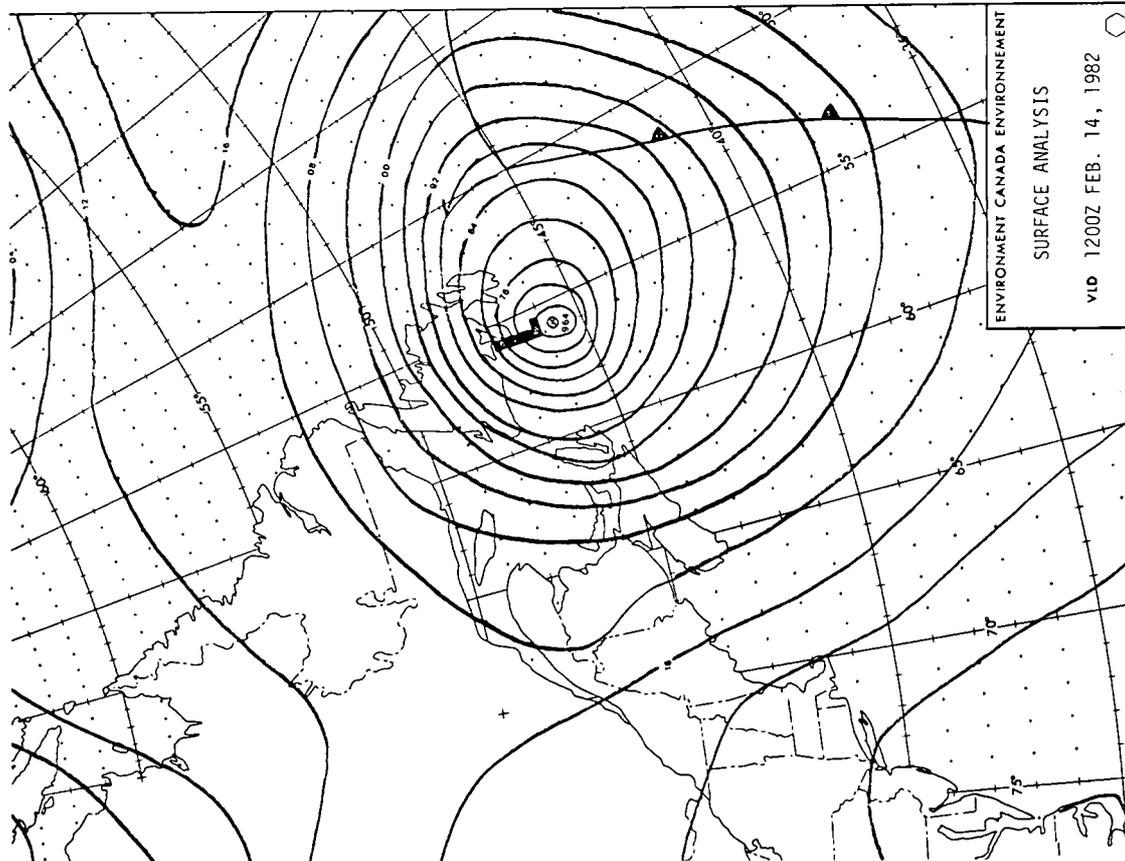


FIGURE 4

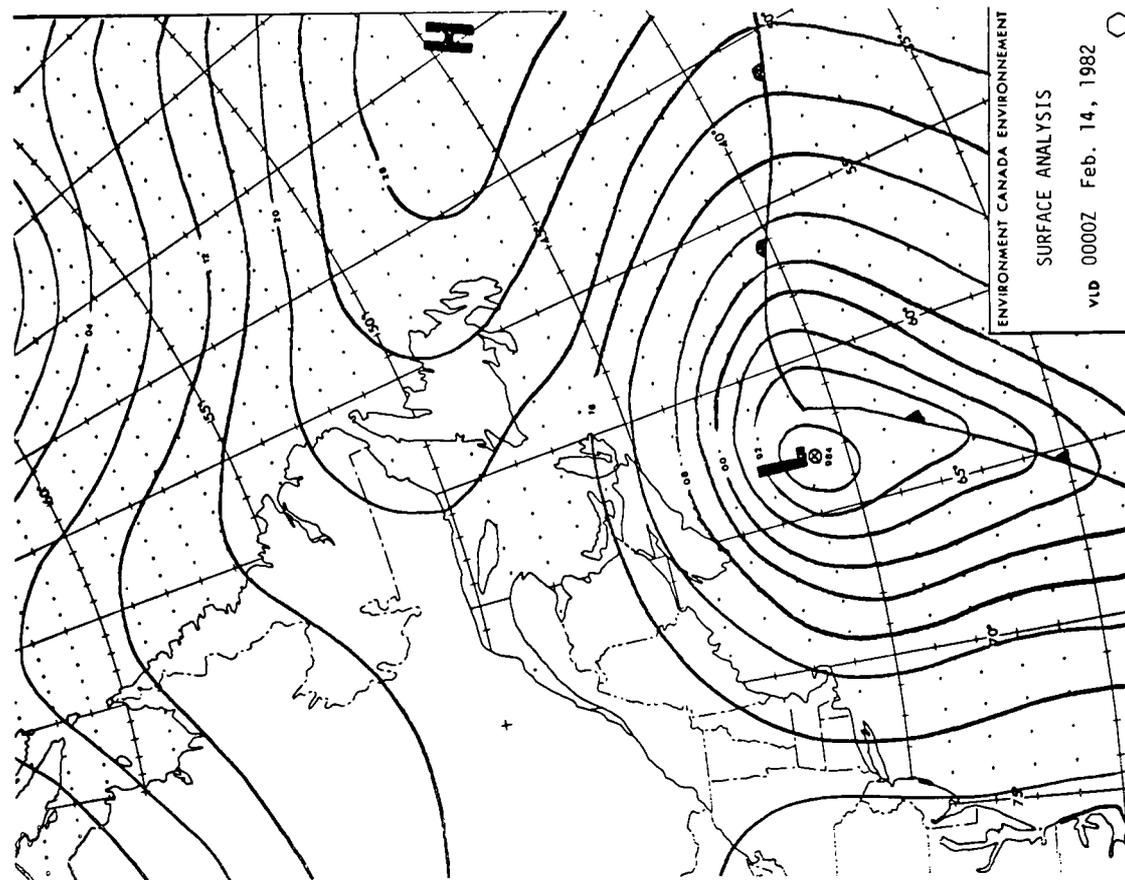


FIGURE 5

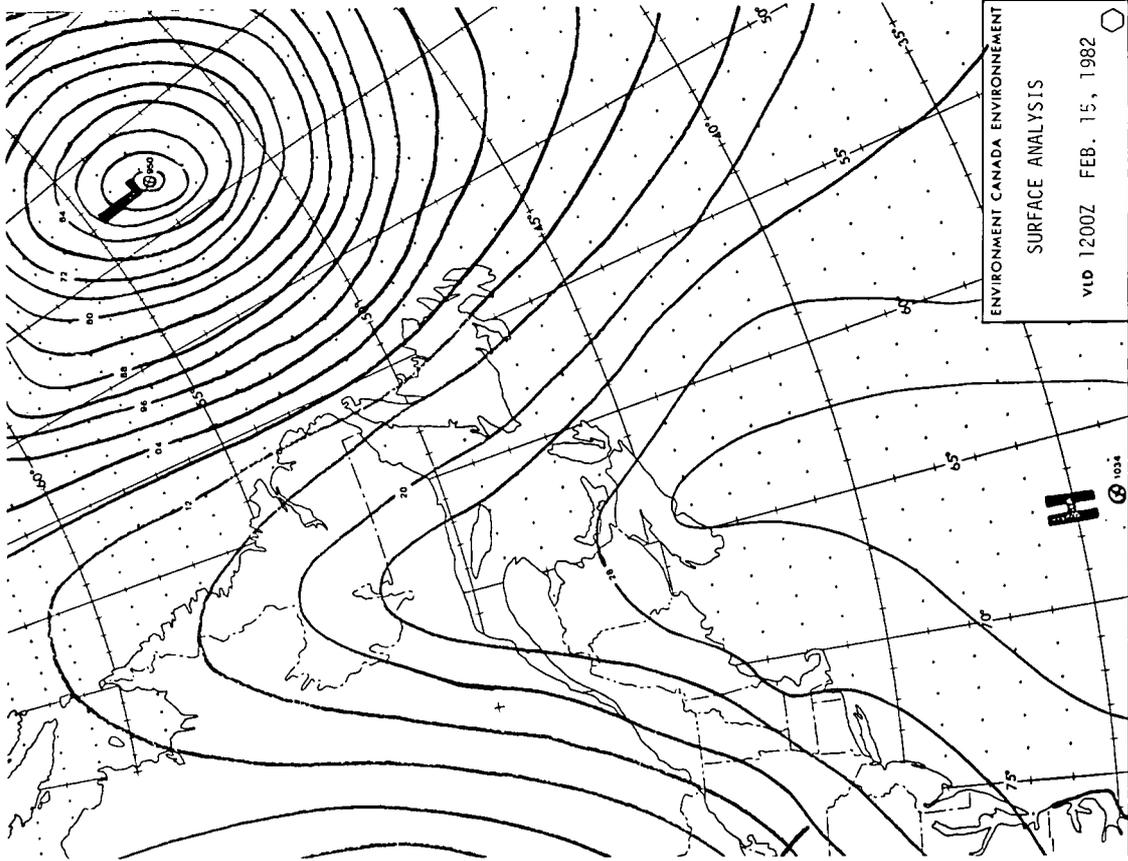


FIGURE 7

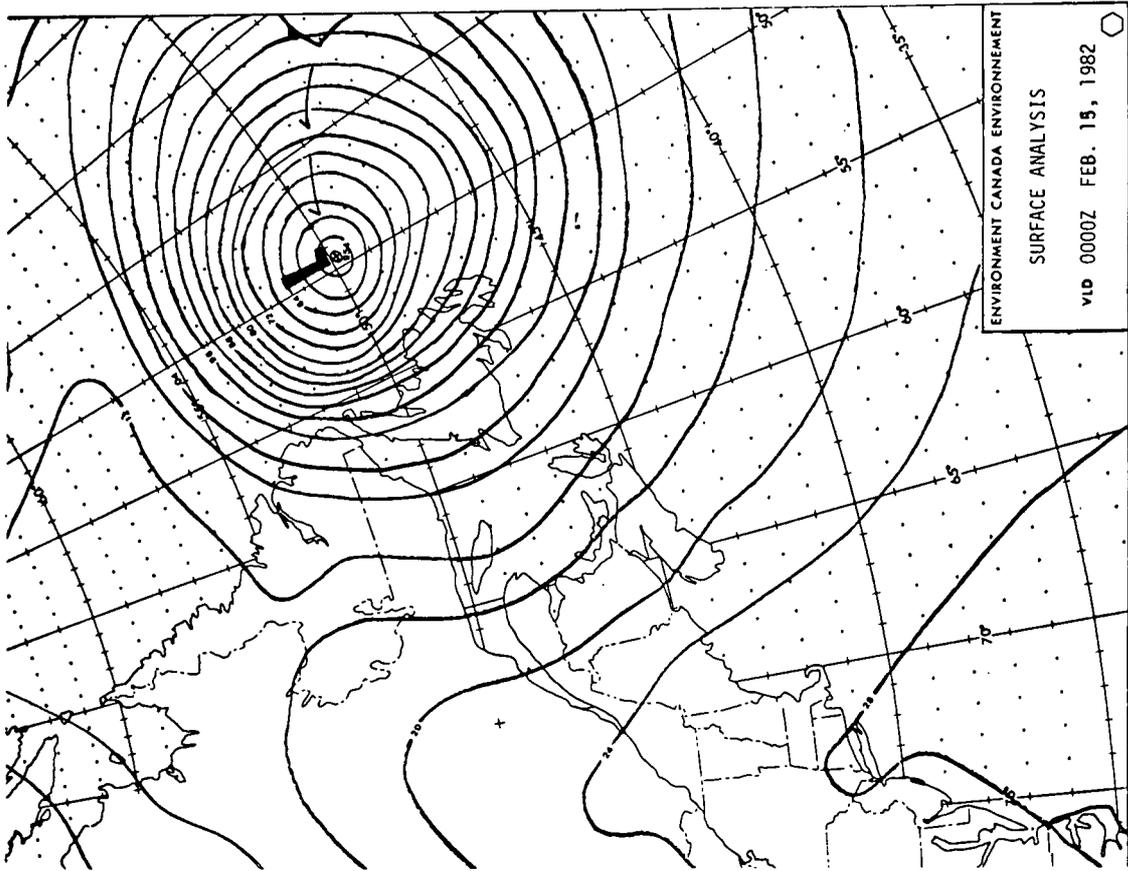


FIGURE 6

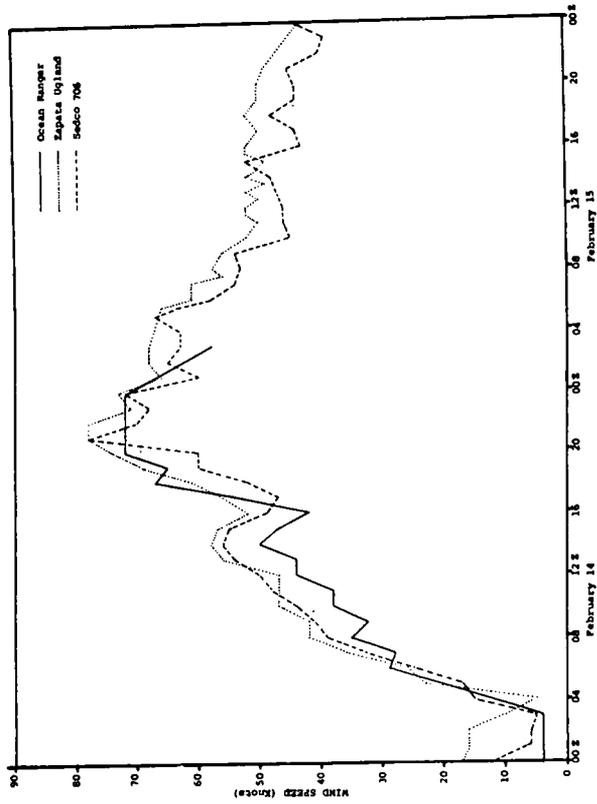


FIGURE 8 Wind speed at Hibernia, February 14-15, 1982.

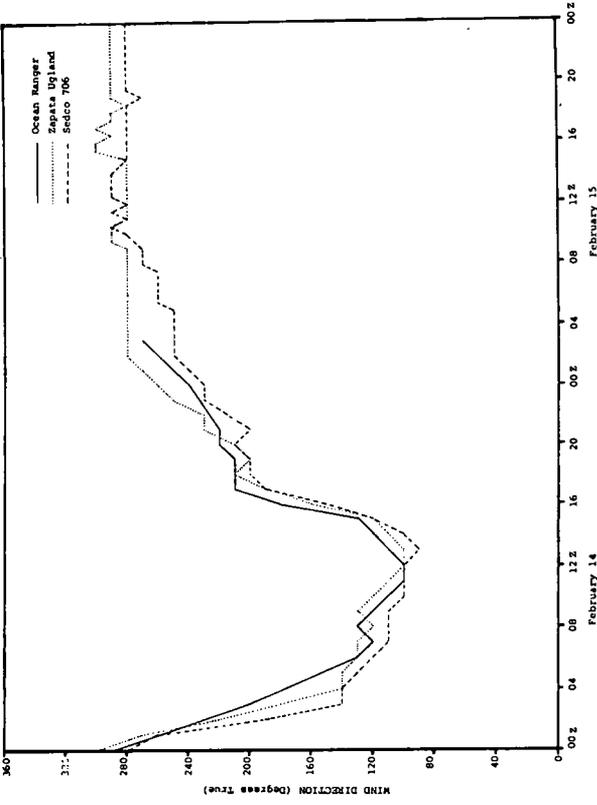


FIGURE 9 Wind direction at Hibernia, February 14-15, 1982.

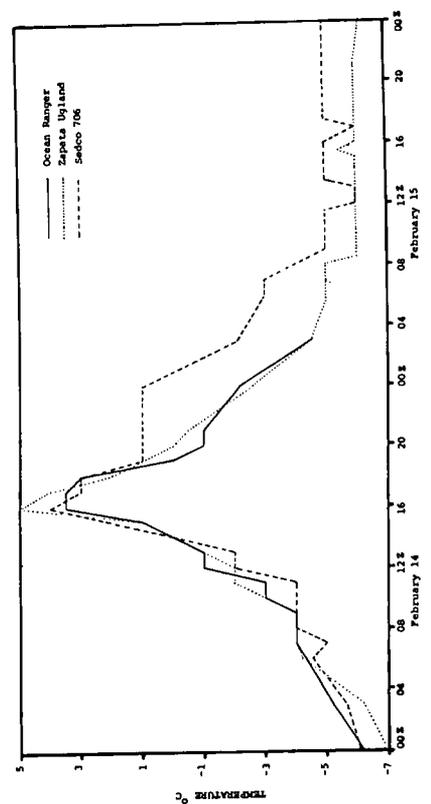


FIGURE 10 Air Temperature at Hibernia, February 14-15, 1982.

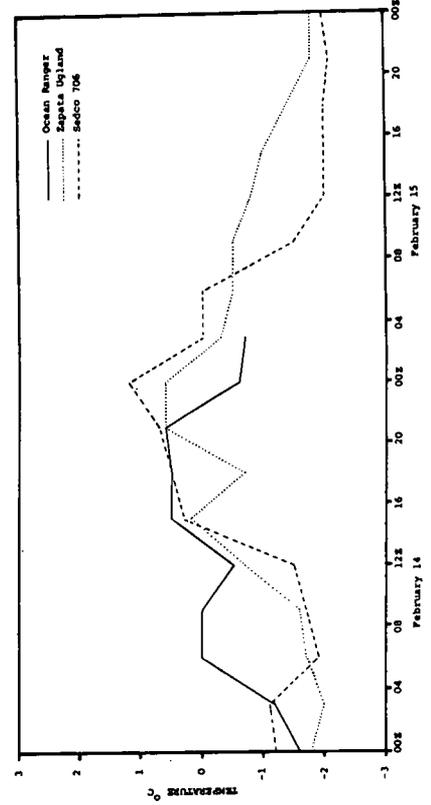


FIGURE 11 Sea surface temperature at Hibernia, February 14-15, 1982.

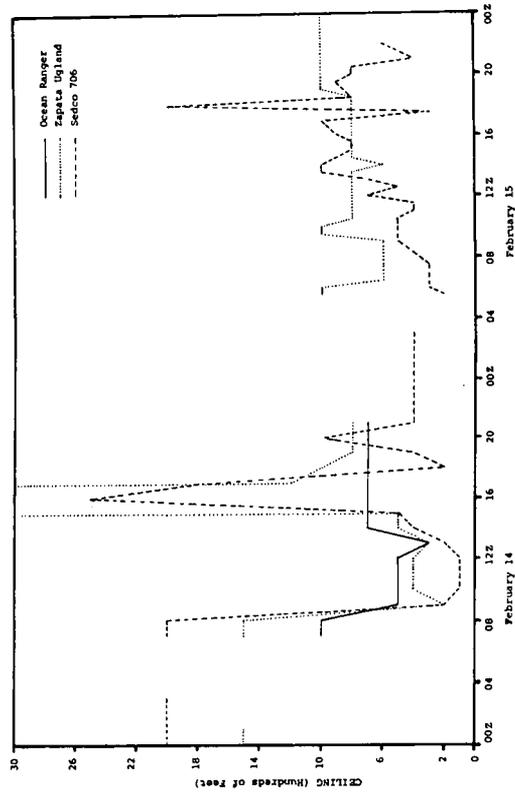
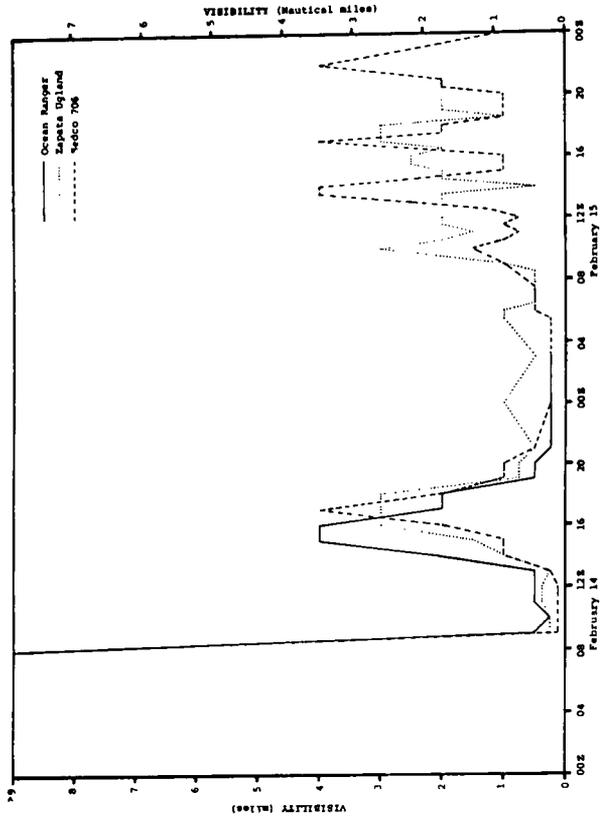


FIGURE 12 Height of ceiling at Hibernia, February 14-15, 1982.

FIGURE 13 Visibility at Hibernia, February 14-15, 1982.

Item E-5
Wave Data from the Zapata Uglund,
Station 140, February 14 to 16, 1982

Table with columns: RECORD, FEB, 1982, HOURS-DAY, and 24 columns of wave data (2.0 to 24.0). Includes CHAR, WAVE, and PEAK columns.

Table with columns: RECORD, FEB, 1982, HOURS-DAY, and 24 columns of wave data (2.0 to 24.0). Includes CHAR, WAVE, and PEAK columns.

Table with columns: RECORD, FEB, 1982, HOURS-DAY, and 24 columns of wave data (2.0 to 24.0). Includes CHAR, WAVE, and PEAK columns.

Item E-6

Weather Observations for February 14, 15, 1982 from the Zapata Upland, SEDCO 706, Ocean Ranger.

Date	Time (GMT)	Sky Condition	Vis (mi/ten)	Wx	NSL Pres. (mb)	Air Temp (deg F)	Dew Pt (deg F)	Wind Dir (true)	Wind Spd (kts)	Chg (kts)	Alt. Sighting (ft)	Press. Trend (mb)	SST (deg C)	Sea Hgt (ft)	Dir. (deg)	Dist. (mi)	Shell (ft)
14	0000	E15 BRN	15+	S-	1027.1	-7.0	-11	300	17		30.32	/ 0.1	-1.8	07	2.5		
0100		E15 BRN	15+			-7	-12	270	16		30.34						
0200		Decharged	11-27		1024.9	-4.2	-11	190	10			\ 2.2	-2.0		300	08	2.5
0400								140	05								
0500								140	23								
0600		X	11-27		1020.3	-4.2	-8	130	26			\ 4.6	-1.7	04	1.0		
0700		E15 OVC	15+					130	36		30.00						
0800		E15 OVC	15+					120	42		29.91						
0900		P2 X	1/4	S	1011.8	-3.5	-7	130	42	047	29.87						
1000		P4 X	1/4	S		-3	-4	120	47		29.72						
1100		P4 X	3/8	S		-2	-3	110	47	056	29.59						
1200		P4 X	3/8	S	999.3	-2.0	-2	100	47	058	29.50						
1300		P3 X	1/4	S		-1	-1	100	56	065	29.31						
1400		-X E5 OVC	1	R-F				110	58	074	29.15						
1500		-X E5 OVC	1 1/2	R-F	993.1	0.9	0	120	57	066	29.02						
1600		-X E5 OVC	3	F		5	3	160	57	075	28.91						
1700		-X E12 BRN	3	F		4	2	190	56	062	28.87						
1800		-X E10 OVC	3	F	935.1	2.0	-1	210	61	069	28.78						
1900		-X E8 OVC	3/4	F		-2	200	64	084	28.70							
2000		-X E8 OVC	3/4	F		0	0	210	74	088	28.64						
14	2100	7-9 OVC Sc	1/2-1	F	968.9	-0.5	-0.5	230	78	085		\ 6.2	+0.6	06	4.0		
2200								230	78	085							
2300								250	71	086							

Date	Time (GMT)	Sky Condition	Vis (mi/ten)	Wx	NSL Pres. (mb)	Air Temp (deg F)	Dew Pt (deg F)	Wind Dir (true)	Wind Spd (kts)	Chg (kts)	Alt. Sighting (ft)	Press. Trend (mb)	SST (deg C)	Sea Hgt (ft)	Dir. (deg)	Dist. (mi)	Shell (ft)
15	0000	X	1-2	R-S-	970.9	-2.6	-5	260	73	082		\ 2.0	+0.6	12	10.0		
0100								270	66	078							
0200								280	66	076							
0300		X	1/2-1	S	976.1	-4.5	-5	280	66	075	29.09						
0400		E10 OVC	1	R-S	985.3	-5.2	-7	280	61	073	29.09						
0500		P4 X	1/2	R S		-5	-5	280	61	069	29.17						
0600		P4 X	1/2	R S		-5	-5	280	56	068	29.20						
0700		P4 X	1/2	S		-5	-4	280	57	066	29.23						
0800		P4 X	1/2	S		-5	-4	280	56	063	29.28						
0900		E10 OVC	2	S-	991.5	-5.5	-8	280	52	064	29.32						
1000		E10 OVC	2	S-		-6	-6	290	52	061	29.35						
1100		E10 OVC	2	S-F		-6	-6	290	50	059	29.38						
1200		E10 OVC	2	S-F		-6	-6	290	50	059	29.38						
1300		E10 OVC	2	S-F	996.3	-4.7	-10	280	52	060	29.41						
1400		E10 OVC	2	S-F		-4	-4	280	52	060	29.41						
1500		E10 OVC	2	S-F		-4	-4	280	52	060	29.45						
1600		E10 OVC	2	S-F		-4	-4	280	52	060	29.45						
1700		E10 OVC	2	S-F		-4	-4	280	52	060	29.45						
1800		E10 OVC	2	S-F	998.9	-6.0	-8	280	49	056	29.49						
1900		E10 OVC	2	S-F		-6	-6	280	49	056	29.49						
2000		E10 OVC	2	S-F		-6	-6	280	49	056	29.51						
14	2100	10-15 BRN Sc	2-5	S	1001.5	-4.6	-7	300	50	057	29.54						
2200								300	50	057	29.54						
2300								300	50	057	29.54						
15	0000	X	2-5	S	1005.9	-6.0	-10	290	49	056	29.65						
0100								290	49	056	29.65						
0200								290	49	056	29.65						
0300								290	49	056	29.65						
0400								290	49	056	29.65						
0500								290	49	056	29.65						
0600								290	49	056	29.65						
0700								290	49	056	29.65						
0800								290	49	056	29.65						
0900								290	49	056	29.65						
1000								290	49	056	29.65						
1100								290	49	056	29.65						
1200								290	49	056	29.65						
1300								290	49	056	29.65						
1400								290	49	056	29.65						
1500								290	49	056	29.65						
1600								290	49	056	29.65						
1700								290	49	056	29.65						
1800								290	49	056	29.65						
1900								290	49	056	29.65						
2000								290	49	056	29.65						
14	2100	10-15 OVC	2-5	S	1008.7	-4.2	-8	290	43	086		\ 2.8	-1.8	10	6.5		

* PMS reports. Simultaneous wind speed reported in ship synoptic code is in brackets. PMS - Private Aviation Weather Reporting Service

Zapata Upland

Date	Time (GMT)	Sky Condition	Vis (mi/ten)	Wx	NSL Pres. (mb)	Air Temp (deg F)	Dew Pt (deg F)	Wind Dir (true)	Wind Spd (kts)	Chg (kts)	Alt. Sighting (ft)	Press. Trend (mb)	SST (deg C)	Sea Hgt (ft)	Dir. (deg)	Dist. (mi)	Shell (ft)
14	0000	20-32 OVC	11-27	S-0000F	1028.2	-4.1	-12	280	13			\ 0.3	-1.7	06	4.0		
0100								260	06								
0200								190	06								
0300		20-32 OVC	11-27	S-	1025.8	-5.6	-10	140	05			\ 2.4	-1.1		270	08	2.5
0400								140	15								
0500								130	17								
0600		X	11-27		1021.0	-4.5	-9	120	25			\ 4.8	-1.9		270	06	2.5
0700		E20 OVC	15+					110	32		30.01						
0800		E20 OVC	15+					110	30		29.93						
0900		P2 X	1/8	S	1012.4	-3.5	-5	110	41		29.88						
1000		P1 X	1/8	S		-4	-5	100	44		29.72						
1100		P1 X	1/8	S		-4	-5	100	48		29.63						
1200		P1 X	1/8	S	1000.0	-1.5	-3	100	50		29.51						
1300		P2 X	1/4	S		-2	-3	090	54	59	29.34						
1400		P4 X	1	R		0	-1	100	56	61	29.19						
1500		-X E5 OVC	1	R	984.4	1.5	2	120	55	60	29.05						
1600		E25 BRN	2	F		4	4	150	49		29.01						
1700		E18 BRN	4	F		3	1	190	47		28.91						
1800		E2 BRN 18 BRN	2	F	971.8	3.0	-2	200	52	75	28.85						
1900		E4 BRN 10 OVC	1	F</													

