



ROYAL COMMISSION

STEAM TANKER ARROW

FINAL REPORT

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Ottawa, 1971

REPORT OF THE
ROYAL COMMISSION
POLLUTION OF CANADIAN WATERS BY OIL
and
FORMAL INVESTIGATION INTO GROUNDING
of
STEAM TANKER "ARROW"

IN THE MATTER OF the Royal Commission Inquiry and Formal Investigation into the circumstances surrounding the grounding of Steam Tanker ARROW on Cerberus Rock in Chedabucto Bay, Nova Scotia, on February 4, 1970, the subsequent sinking of the Ship, the pollution of Canadian Waters by Oil escaping therefrom and the Measures taken to Prevent or Minimize such Pollution Damage,

-AND-

IN THE MATTER OF the Inquiries Act, Chapter 154 of the Revised Statutes of Canada 1952, and the Canada Shipping Act, Chapter 29 of the Revised Statutes of Canada, 1952.

BEFORE THE HONOURABLE MR. JUSTICE GORDON L. S. HART,
Commissioner.

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LETTER OF TRANSMITTAL

The Hon. Don Jamieson
Minister of Transport
Ottawa, Canada

Dear Mr. Jamieson:

I have the honour to transmit herewith the report of the Royal Commission Inquiry and Formal Investigation into the circumstances surrounding the grounding of the Steam Tanker ARROW on Cerberus Rock in Chedabucto Bay, Nova Scotia, on February 4, 1970. the subsequent sinking of the ship, the pollution of Canadian Waters by oil escaping therefrom and the measures taken to prevent or minimize such pollution damage, pursuant to the Order of His Excellency the Governor General in Council dated March 12, 1970, P.C. 1970-448.

Your Commissioner was also appointed on the same date a Commissioner pursuant to section 558 of the Canada Shipping Act for the purpose of holding a formal investigation into the circumstances surrounding the grounding of the Steam Tanker ARROW on Cerberus Rock in Chedabucto Bay, Nova Scotia on February 4, 1970. This formal investigation was completed and you will recall that my Report containing the findings of the Court of Inquiry was filed with you on July 23, 1970. All matters relating to the responsibility for the grounding of the ARROW were dealt with during the formal investigation and all matters relating to pollution caused by the escape of oil from the ARROW were reserved for subsequent hearings to be conducted pursuant to the Inquiries Act. My Report of July 23, 1970 containing the judgment of the Court of Inquiry establishing the responsibility for the grounding of the ARROW is attached as Appendix "A" to this Report.

The Commission has held a complete and comprehensive public inquiry into the circumstances surrounding the grounding of the Steam Tanker ARROW on Cerberus Rock in Chedabucto Bay on February 4, 1970, the subsequent sinking of the ship, the pollution of Canadian Waters by oil escaping therefrom and the measures

taken to prevent or minimize such pollution. Hearings were held at Halifax and at Port Hawkesbury during the months of September, October, November and December of 1970. These hearings were duly advertised and all persons wishing to attend and participate in the hearings or make presentations to the Commission were given ample opportunity to do so.

Excellent facilities for the holding of the Commission's public hearings were provided by the Law School of Dalhousie University, the Province of Nova Scotia which made available the House of Assembly chamber, and by the Town of Port Hawkesbury.

The Commission appreciates the assistance it has received from its secretary, Miss Patricia Martin, its clerk, Mr. Edgar Gold in the administration of its work, and the excellent manner in which the evidence was placed before it by its counsel Vincent Morrison, Q.C., and Peter Richard; and is greatly indebted to Dr. Gordon A. Riley, Ph.D., for acting as scientific adviser. The high calibre of counsel appearing for the various parties interested in the Inquiry has also tended to ease the task of the Commission in fulfilling its terms of reference.

Yours faithfully,



Gordon L. S. Hart
Commissioner

Halifax, Nova Scotia

PRIVY COUNCIL

CANADA

The Committee of the Privy Council have had before them a report representing:

That it is deemed expedient and in the public interest respecting the prevention of pollution of Canadian Waters by oil from tankers that a complete and comprehensive public inquiry be made into the circumstances surrounding the grounding of the Steam Tanker "ARROW", on Cerberus Rock, in Chedabucto Bay, Nova Scotia on the 4th day of February, 1970;

That the Honourable Gordon L. S. Hart has, pursuant to the authority vested in the Minister of Transport under section 558 of the Canada Shipping Act, been appointed Commissioner for the purposes of holding a formal investigation into the circumstances surrounding the grounding of the steam tanker "ARROW" on Cerberus Rock, and the subsequent sinking of the ship.

The Committee, therefore, on the recommendation of the Minister of Transport, advise that the Honourable Gordon L. S. Hart, a Judge of the Supreme Court of the Province of Nova Scotia, Halifax, Nova Scotia, be appointed a Commissioner under Part I of the Inquiries Act to inquire into and report upon the pollution of Canadian waters by oil escaping from the steam tanker "ARROW" following the grounding of the said tanker on Cerberus Rock in Chedabucto Bay, Nova Scotia on the 4th day of February, 1970.

The Committee further advise

- 1) That the Commissioner be authorized to exercise all the powers conferred upon him by section 11 of the Inquiries Act;
- 2) That the Commissioner adopt such procedure and methods as he may from time to time deem expedient in the proper conduct of the inquiry and sit at such time and at such places as he may decide from time to time;

- 3) That the Commissioner be authorized to engage the services of such counsel, staff and technical officers as he may require, at rates of remuneration and reimbursement approved by Treasury Board; and
- 4) That the Commissioner report to the Governor in Council with all reasonable despatch.

Certified to be a true copy
Copie certifiée conforme

J. L. Cross

Assistant Clerk of the Privy
Council
Le greffier adjoint du conseil
Privé

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- Appendix B - The evidence taken at the Public Hearings of the Commission, consisting of Volumes 1 to 15 inclusive.
- Appendix C - The Exhibits filed with the Commission, a list of which is set forth below.

Exhibit Mark	Description	Transcript Page Reference
P-1	Canadian Chart No. 4335. "Strait of Canso and Approaches." (Similar to Exhibit C-8 tendered at first hearing)	10-11; 27
P-2	Capacity Plan H-4463-11-12 S.T. OLYMPIC GAMES (ARROW) Bethlehem Sparrows Point Shipyard, Maryland, U.S.A. (Photostat) (Similar to Exhibit C-13 tendered at first hearing.)	11; 44; 62-63; 173-4; 510-1; 564
P-3	Colour photograph. Aerial shot of Stbd. side of ARROW stern section.	63-64;
P-4	Colour photograph. Aerial shot of Port side of ARROW stern section.	63-64;
P-5	Colour photograph. Aerial shot of stbd. side of ARROW stern section (close-up).	63-64;

Exhibit Mark	Description	Transcript Page Reference
P-6	Requisition for Salvage equipment (xerox)	275-277; 860-2; 866-8; 880
P-7	Organization plan "Operation ARROW" (Mr. H. Clare)	425-429; 720;
P-8	Report of use of 'Seabeads' to burn oil from tanker ARROW. Pittsburgh Corning Glass Co.	434-436;
P-9	Photo Reproduction of Canadian Chart No. 4335 showing oil pollution areas. Compiled by Dr. Warner.	540-1;
P-10	Oil spill Cleanup Manual. Standard Oil Company (New Jersey).	544-460; 496
P-11	Letter from International Tanker Pollution Federation Ltd. (Tovalop) (xerox).	626-8;
P-12	S.S. ARROW Salvage & Oil Pollution Prevention. Organization Chart (xerox) (Mr. J. Hornsby)	718-720;
P-13	Letter from M. O. Tomkins to J. Hornsby (xerox).	898-9;
P-14	Folio of 12 colour photographs taken by Dr. Martin Thomas, Feb. 13, 1970. Oiled Beach - Janvrin Causeway.	966
P-15	Folio of 11 colour photographs taken by Dr. Martin Thomas, Feb. 13, 1970, Janvrin Lagoon, Oil on and under ice, burning with Sea Beads.	966

Exhibit Mark	Description	Transcript Page Reference
P-16	Folio of 12 colour photographs taken by Dr. Martin Thomas. Feb. 14, 1970, Janvrin Island Shore (causeway to Lagoon).	967-9;
P-17	Folio of 12 colour photographs taken by Dr. Martin Thomas. Feb. 15, 1970, Janvrin Causeway and Oiled Beach - Deep Cove. Oil and ice.	967; 969-70;
P-18	Report on Activities in connection with the Oil Spill from the tanker ARROW in Chedabusto Bay, N.S., February 1970 by M.L.H. Thomas. (xerox)	980-1;
P-19	Diagrams by Maurice R. Evans: Steam tanker ARROW - Positions following stranding 4 Feb. 1970.	579-580; 993; 1482-3;
P-20	Handwritten note by Mr. M. Costeletos	1078-1081;
P-21	Colour film, 16 mm./Imperial Oil Co. of ARROW operation.	996-7; 1025; 1339
P-22	ARROW Footage CBC Film, Cans 46/7 (In custody of CBC - available on request).	1339-40;
P-23	CCIW Activities relative to the Oil Spill caused by the sinking of the Tanker ARROW in Chedabusto Bay, by A. R. Lefevre, Environmental Quality Coordinator, Canada Centre for Inland Waters.	1375;
P-24	Submission on behalf of the Municipality of Richmond submitted at Port Hawkesbury by the Very Rev. A. P. Poirier.	1521-1525

Exhibit Mark	Description	Transcript Page Reference
P-25	Submission on behalf of the teachers and students of Isle Madame District High School. Submitted at Port Hawkesbury.	See Vol. 9
P-26	Chart showing Areas worked by Beach-cleaning operations of 'Operation Oil'. Compiled by Capt. M.S. Greenham and submitted at Port Hawkesbury.	See Vol. 9
P-27	Chart showing Employment of Government vessels during Operation 'ARROW'.	1618-1620;
P-28	Chart showing Helicopter Utilization during Operation 'ARROW'.	1620-1624; 1757;
P-29	Original Echo-Sounder Chart showing Wreck of ARROW and Cerberus Rock area.	1630-1632;
P-30	Heat loss Study of Esso International INC. plus relevant correspondence and chart.	1636-1632;
P-31	Report on Cargo Salvage Operation ARROW Chedabucto Bay, February 12 to April 11, 1970 by S. A. Madsen.	1648-1650;
P-32	Various sketches of Operation/Hot-tap Method drawn by Capt. S.A. Madsen.	1781-1791;
P-33	House of Commons, Bill C-2 "An Act to Amend the Canada Shipping Act."	1807-8;

Exhibit Mark	Description	Transcript Page Reference
P-34	Letter from James Hornsby, Dept. of Transport, Halifax, containing Recommendations arising out of ARROW operation. (Original).	1812;
P-35A	Report of the Task-Force - OPERATION OIL (Cleanup of the ARROW Oil Spill in Chedabucto Bay) to the Minister of Transport. VOLUME ONE. *****	1817-8; 1881; 1888; 1892; 1899-1900; 1903; 1926; 1938-41; 1946-7; 1966; 1976-7; 1990; 2022;
P-35B	OPERATION OIL. Report of the Scientific Coordination Team to the Head of the Task Force July 1970. Prepublication Edition. *****	1817-8; 1935-6; 1953; 1972; 1983; 1990; 2162;
P-35C	Report of the TASK FORCE - OPERATION OIL. VOLUME THREE, Parts 1 to 3. (Proof Copy). *****	1817-8; 1990-1;
P-35D	Report of the TASK FORCE - OPERATION OIL. VOLUME THREE, Parts 4 to 11. (Proof Copy).	1817-8; 1990-1;
P-36	TOVALOP, Tanker Owners Voluntary Agreement concerning Liability for Pollution Information Booklet.	2061; 2073-6;
P-37	ITIA, International Tanker Indemnity Association Limited, Rules. (Incl. Memorandum Amendment).	2063;
P-38	<u>'Torrey Canyon' Pollution and Marine Life.</u> A Report by the Plymouth Laboratory of the Marine Biological Association of the United Kingdom, Treatise, ed. by J. E. Smith.	2082;

Exhibit Mark	Description	Transcript Page Reference
P-39	Scientific Aspects of the Oil Spill Problem, Max Blumer, Senior Scientist, Dept. of Chemistry, Woods Hole Oceanographic Institution, Woods Hole, Mass. 02543. (xerox).	2100-5;
P-40	Water Pollution by Oil - Some Health Considerations. A.E. Martin, M.D., D.P.H., Senior Medical Officer, Dept. of Health and Social Security. (xerox).	2105;
P-41	Schematic Representation of Gas Liquid Chromatography. (8 pages).	2181-6; 2189;
P-42	Chart: D-6, 7-4013 Halifax to Sydney. Canadian Hydrographic Service.	2273-6; 2280; 2308-10;
P-43	Chart: D6-4335. Strait of Canso and Approaches. Canadian Hydrographic Service.	2280;
P-44	Chart: D6-4307. Canso Harbour to Strait of Canso. Canadian Hydrographic Service.	2280;
P-45	Chart: 4306. Strait of Canso and Southern Approaches. Canadian Hydrographic Service.	2280; 2283;
P-46	Resume of Activities and Observations of Dept. of Fisheries and Forestry Staff at Chedabucto Bay during period Feb. 4 to 20, 1970. (xerox).	None
P-47	IMCO. Inter-Governmental Maritime Consultative Organization. Information Booklet.	2269;

Exhibit Mark	Description	Transcript Page Reference
P-48	IMCO. Activities re the Prevention of Pollution of the Marine Environment. (Min. of Transport Note).	2269;
P-49	Interim Federal Contingency Plan for Combatting Oil and Toxic Material Spills, prepared by Marine Operations, July 1970.	2269;
D-8	Aerial Photograph No. 70-228. (Copy of Exhibit D-8 tendered at first hearing).	128-9; 684-5; 1318-19; 1340; 1662; 2248-50;
D-10	Aerial Photograph No. 70-229 (Copy of Exhibit D-10 tendered at first hearing)	128-9; 1662-3; 2248-50;
D-31	8 photographs (lettered A to H) taken on board S.T. ARROW. (Copy of Exhibit D-31 tendered at first hearing).	128-9; 1316-7;
C-41	American Bureau of Shipping. Survey Report No. CU-748. S.T. ARROW, January 29, 1970. (22 pages photostat). (Copy of Exhibit C-41 tendered at first hearing).	1119-1121;

GLOSSARY OF NAMES MENTIONED IN REPORT
(Alphabetical)

Position as of February 1970

ALEXANDER, Captain Richard	United States Navy, Assistant Chief of Staff for Operations and Logistics, U.S. 1st Naval District, Boston, Massachusetts
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CAMPBELL, Daniel James	Pilot, Port Hawkesbury, N.S.
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COSTELETOS, Marinos	Naval Architect & Technical Manager, Olympic Maritime (SA), Monte Carlo, Monaco
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Position as of February 1970

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Position as of February 1970

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SMITH, Hon. G. I. Premier of Nova Scotia

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Position as of February 1970

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Position as of February 1970

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Port Captain, Central American
Steamship Agency, New York

YOUNG, Capt. James R.

Master, C.C.G.S. NARWHAL

NOTE: See also pp. 130-131 of the Report.

CHAPTER I

BACKGROUND

At 9:35 in the morning on February 4, 1970, while running through Chedabucto Bay towards Port Hawkesbury with a cargo of 16,010 tons of Bunker "C" fuel, the Steam Tanker ARROW ran aground on Cerberus Rock, a well charted navigational hazard lying within the internal waters of Canada. A formal investigation into the grounding was conducted by your Commissioner, assisted by two nautical assessors and it was determined that the grounding of the ARROW was caused by the improper navigation of Captain George Anastassopoulos in failing to maintain his plotted course into Chedabucto Bay and in failing to check his ship's position in relation to that plotted course for over an hour while he was proceeding at virtually full speed through waters unfamiliar to him. The judgment of the Court of Inquiry setting forth in full the facts leading up to the grounding is attached hereto as Appendix "A", and it is the intention of the Commission to deal only with the events occurring subsequent to the grounding, leading to the pollution of Canadian waters and the shores of Chedabucto Bay, Nova Scotia by oil escaping from the ARROW in this report. Some background information, however, is necessary in order to fully understand those events, and should be placed before you at this time.

The ARROW was a single screw, steel steam turbine tanker with a registered length of 529.4 feet and breadth 63 feet, and depth of 37.5 feet, having a gross tonnage of 11,379.37 tons, and a net tonnage of 6897 tons. She was built by Bethlehem's Sparrows Point Shipyard, Inc. at Maryland, U.S.A. in 1948, and contained 27 tanks for carrying petroleum products, numbered 1 to 9 centre, starboard and port wings. All tanks were connected by piping running along the bottom of the ship to the pump room in

the after end, and in order to load or unload the cargo tanks by the use of its own electric pumps, steam must be raised and the ship's electrical system operating. The cargo tanks were numbered from bow to stern with the bridge superstructure of the ship located above cargo tanks 3 and 4, and the pump room, engine room, boiler room and crew's quarters superstructure located astern of cargo tank number 9.

The ARROW was owned by Sunstone Marine (Panama) SA, being the main asset of that company, and was operated by Olympic Maritime SA of Monte Carlo, a company that manages some 65 ships totalling in excess of three and a half million tons, generally known as the Onassis Fleet. These ships are oil tankers and bulk carriers ranging from 16,000 tons dead weight to 200,000 tons dead weight, most of which are less than ten years old. The ARROW being 22 years old was the second oldest ship in the fleet. Each ship managed by Olympic Maritime SA is owned by a separate company, and the majority of the ships are registered with the Republic of Liberia.

The ARROW was last surveyed by the American Bureau of Shipping at Aruba between January 19 and January 29, 1970. She was recommended for retention of classification A1 (e) oil carrier which is the highest classification for tankers issued by the American Bureau of Shipping. She was also in possession of all the required certificates of a safety convention ship under the International Convention for Safety of Life at Sea, 1960 and these certificates were valid. She was equipped with an emergency diesel generator but its switch was defective and it had not been working for some months. Generally, however, she was an old ship maintained in sufficient condition to meet the requirements of underwriters and international conventions, and met Canadian requirements for ships plying Canadian

waters at the time. Although some of the ship's navigational equipment was not functioning properly, the grounding was caused by human negligence rather than equipment failure as is pointed out in the judgment of the Court of Inquiry.

The ARROW was manned by a Captain, officers and crew of 33, all except one of whom were Greek nationals. Although this was the first trip into Canadian waters with Captain Anastassopoulos in command, she had made fifteen previous voyages to Canadian ports on the East coast and in the St. Lawrence, and her record of performance was satisfactory. On July 6, 1965 her owners had entered into a Time Charter Party Agreement with Standard Tankers (Bahamas) Company Limited for a term of about ten years, and on March 31st, 1968 Standard Tankers (Bahamas) Company Limited had entered into a Tanker Voyage Charter Party Agreement with Imperial Oil Limited for the transportation of petroleum products from loading ports in the Caribbean Sea for discharge in East or West coast Canadian ports, both Standard Tankers and Imperial Oil Limited being affiliates of Standard Oil of New Jersey. It was pursuant to these arrangements that the ARROW was loaded at Amuay Bay, Venezuela and directed to proceed with a cargo of approximately 16,000 tons of Bunker "C" oil to Port Hawkesbury, Nova Scotia for delivery of the cargo to Nova Scotia Pulp Limited. It was during this last fateful voyage that she grounded on Cerberus Rock in Chedabucto Bay, Nova Scotia.

The Bunker "C" cargo was distributed amongst all of her tanks except number 5. The number 5 wing tanks were empty and number 5 centre tank contained 79.5 tons of a lighter grade fuel. The fuel oil cargo was maintained at a temperature of 135 degrees F during the voyage by steam, so that it would be pumpable when arriving at its destination.

Although this temperature is the most desirable for efficient off-loading of cargo, it can still be pumped at temperatures as low as 60-70 degrees and this is an important factor to be borne in mind when a situation develops in which the capacity of the ship to heat the oil is destroyed. In such a circumstance the temperature of the oil will drop approximately 16 degrees the first 24 hours in North Atlantic waters and a lesser number of degrees during each 24-hour period following the ship's inability to provide heat. As the petroleum cools it forms a heavy layer near the side of the tank, which itself acts as a deterrent to the rate of cooling thereafter. Needless to say, the wing tanks will cool more rapidly than the centre tanks, because they are in direct proximity to the water temperature.

Chedabucto Bay is a large body of water approximately 30 miles long and eight to ten miles wide, separating the Northern shore of Nova Scotia from the Southern shore of Cape Breton Island. The Northern side of the Bay leads to the Strait of Canso, running in a northwesterly direction to the area of Port Hawkesbury and then northerly past the Canso Causeway to the Northumberland Strait. The town of Port Hawkesbury has been expanding rapidly in recent years and its population swelling to meet the needs of the new industries locating in the vicinity. A very large pulp mill has located there and a substantial oil refinery is being constructed, as well as a heavy water plant and other new firms. Much of the development has been spurred by the creation of a deep-water all-weather harbour capable of handling the largest ships now on the drawing boards in the construction yards of the world, and a tremendous increase in the volume and size of cargo ships using the port is expected.

Most of the land surrounding Chedabucto Bay, however, is undeveloped except in areas where fishing is the main industry. The main fishing centres are found on the

large islands bordering the North shore of the Bay at Arichat on Isle Madame and Petit-de-Grat, and also at Canso on the Southern side of the Bay.

Cerberus Rock is a large underwater hazard with its pinnacle just about awash at low tide, located on the Northern side of the Bay directly in the path of a ship heading in from the Atlantic towards the Strait of Canso. Its position is clearly indicated on navigational charts of the area and a clear warning of this hazard may be found in navigational publications published in Canada, Great Britain and the United States. The usual approach to the Strait of Canso is therefore plotted one or two miles to the South of Cerberus Rock so as to avoid difficulty and there is ample deep water for ships to pass in this manner. At the time of this unfortunate grounding, the practice was for ships approaching Port Hawkesbury to proceed beyond the Cerberus Rock position before taking on a pilot for the completion of the voyage, and this was the intention of the Captain of the ARROW on that fateful morning.

The weather in Chedabucto Bay on the morning of February 4, 1970, was overcast with patches of mist. The wind was southerly force 7 to 8 on the Beaufort scale and waves of 4 to 6 feet were being experienced with the tops of the waves being blown off in streaks along the direction of the wind. The visibility at the time of the grounding was between 5 and 6 miles.

At 9:35 a.m., while Captain Anastassopoulos was bringing the ARROW to what he considered to be the end of his sea voyage, and approaching to the position at which he would take on his pilot, and while his ship was travelling through the water at a speed of about 12 knots on a course of 291 True, the ARROW ran aground. The bow of the ship struck the submerged rock about 200 feet from its pinnacle

and the Captain, who had thought his ship was a mile to the South of Cerberus Rock, realized that he had struck Cerberus Rock. It is into the events that followed on that day and thereafter, that the Commission has made exhaustive inquiry. I have chosen to relate these events in chronological order day by day so that we may understand more readily the various roles played by the many people who became entangled in the results of the grounding of the ARROW.

CHAPTER 2

FEBRUARY 4, 1970 - GROUNDED BUT NO ASSISTANCE REQUIRED

Captain Anastassopoulos was on the bridge when the ARROW struck Cerberus Rock. He realized his ship was aground but did not consider it to be in any danger. The tide was at half ebb and would be low at 12:20 p.m. Soundings were taken by the Chief Engineer and some of the cargo transferred to the empty tanks of number 5, so as to lighten the forward end of the ship. Engines were put at full speed astern and the helm manoeuvred from full port to full starboard.

As soon as Captain Anastassopoulos had assessed the situation, he followed the procedure laid down by his company and advised the owners of the grounding by sending a cable to SunAm Ships, the cable address of the New York office of Olympic Maritime. He advised them of his position and that he expected to release the ship from its predicament at high tide later that day. The Captain then made contact with Mr. McInnis, his local shipping agent at Port Hawkesbury, and asked him to arrange through the New York managers for a large barge and tug to be sent to the scene to assist him in removing his ship from the Rock.

The message from the Captain of the ARROW to the local agent at Port Hawkesbury was relayed through the pilot boat, the LADY MOOD. On the previous day arrangements had been made by Mr. Leslie McInnis, the local agent, to have a pilot board the ARROW at 10:00 a.m. on the 4th. The usual boarding location was out beyond Eddy Point, several miles inland from Cerberus Rock and so Mr. Daniel James Campbell, a local pilot, proceeded to the residence of Mr. Langley at Port Hawkesbury at 8:45 a.m. Arthur Langley ran the pilot boat and was scheduled to take Mr.

Campbell out to the ARROW for this engagement. They tried to raise the ARROW by radio from Mr. Langley's residence but were unable to do so and therefore proceeded to the pilot boat about 9:00 a.m., and from there to Eddy Point about five miles from Cerberus Rock. This was the usual position for a pilot to board an incoming tanker in the area and they waited here from 9:45 a.m., and tried to raise the ARROW both by VHF and radio telephone. The sea was very heavy and the weather wasn't fit for a small craft to go outside more than a mile or so, and since the visibility was only three to four miles in that area, they did not see the ARROW. No contact was made until they heard from Captain Anastassopoulos shortly before noon.

The pilot received word from the Master that the ARROW was definitely aground on Cerberus Rock and that he was working his engines and trying to back off. A second message was received 25 minutes later requesting the pilot to notify the ship's local agent of the grounding and that he arrange for assistance from New York to get him off the Rock. He advised her heading had shifted 110 degrees. This message was relayed by Mr. Langley from the LADY MOOD to his shore base by VHF and then Mr. Langley contacted the Canadian government steamer NARWHAL to confirm that they had overheard the conversation with Captain Anastassopoulos concerning the grounding of the ship. He also called the Canadian Coast Guard office in Halifax and advised them what had happened.

Earlier that morning at about 9:35 a.m. Abel Joseph LeBlanc, the light keeper on Jerseyman Island, noticed a tanker stopped near Cerberus Rock and figured that she was aground. He proceeded up his tower from where he had a perfect view of the ship about three and a half miles away to confirm his initial impression, and then went back to his dwelling and contacted Canso radio at approximately 9:45 a.m. He found that Canso radio had not been advised of the

grounding. Canso radio then asked for information from any ship in Chedabucto Bay on the grounding at 10:05 a.m. but had no report until the Jerseyman Island lightkeeper called again at 10:59 a.m. stating that the ship was still aground. At 10:55 a.m. Canso radio notified the Rescue Coordination Centre at Halifax, "Lightkeeper Jerseyman Island reports large vessel appears to be grounded on Cerberus Rock in Chedabucto Bay stop no distress emergency calls or reports heard at this station." At 11:17 a.m. the Coast Guard Rescue officer in Halifax telexed the Master of the C.C.G.S. NARWHAL advising of the report of the grounding and asking "Can you determine if vessel is at anchor or aground." At 11:45 a.m. the Master of the NARWHAL reported to the Rescue Coordination Centre at Halifax and the District Manager of the Department of Transport at Dartmouth that he could not tell from his present anchorage if the ship was aground and that he was proceeding to investigate. At 12:10 p.m. Canso radio contacted the Master of the J. B. NICKERSON, a fishing vessel in the area, and requested if he had noticed a ship aground. His reply was that he noticed a ship on his radar which stopped suddenly.

Just as the Coast Guard vessel NARWHAL was leaving her station in Inhabitant's Bay to proceed into Chedabucto Bay and conduct investigations, the message was received from the Captain of the ARROW advising of her grounding and that no assistance was required. This information was forwarded to Halifax by the NARWHAL and confirmed over Canso radio. The question was then raised by DOT Halifax in a message to Canso radio about the ship's cargo as follows: "Do you know if vessel is loaded with oil, if so could possibly present pollution problem."

At 12:36 p.m. Canso radio broadcast the following message: "Tanker ARROW 5LHI reports aground Cerberus

Rock in Chedabucto Bay, no immediate assistance required stop loaded with fuel oil." This message was sent to the Rescue Coordination Centre at Halifax and the District Manager of DOT at Dartmouth, as well as to Lloyd's of London and Pickford & Black in Halifax, and was based on a call made directly by Captain Anastassopoulos to Canso radio, received at 12:26 p.m. It was therefore almost three hours after the grounding of the ARROW before any information was given to Canadian government authorities concerning the grounding by the Master of the ship and this communication gave no real hint of the potential pollution hazard that had been created. The message was also in due course forwarded for information to the Canadian Coast Guard Rescue Coordinating officer at Halifax and the Regional Director of the air services at Moncton.

After receipt of notification of the grounding and that no assistance was required the NARWHAL remained at her berth in Inhabitant's Bay. At 1:29 p.m. the Master of the J. B. NICKERSON contacted Canso radio and asked whether it was necessary to stand by and render assistance to the ARROW and was advised that it was not necessary. During that Wednesday afternoon Canso radio maintained contact with ships in the area of Chedabucto Bay in an attempt to keep an eye on the situation. At 2:36 p.m. Canso asked the J. B. NICKERSON for a report on the situation and whether the ship was able to get off on its own. The reply was in the negative. A call was then placed to the ARROW and she was asked to advise whether she was planning to unload any of her oil cargo. The answer was also negative. The Department of Transport in Halifax by this time had received unofficial information from the trawler J. B. NICKERSON that the ARROW may be planning to unload her cargo and when this was passed on to Canso radio, Halifax was advised that word had been

received from the ARROW to the effect that they were not planning to unload any of their cargo. In any event, Halifax advised that they would alert the steamship inspection men re the possibility of off-loading.

About 2:30 p.m. Barry Strang, a steamship inspector at North Sydney, received a call from the senior inspector in Mr. Hornsby's office at Halifax. James Hornsby was the regional superintendent of the Steamship Inspection Service of the Department of Transport for the Maritimes. One of the duties assigned to the Steamship Inspection Service was the administration of the Oil Pollution Prevention Regulations made under the Canada Shipping Act. These regulations were made pursuant to the authority of section 495 A which approved the International Convention for the Prevention of Pollution of the Sea by Oil 1954, and provided for imposition of fines not exceeding five thousand dollars against persons discharging oil or oily mixture from a ship into Canadian waters, unless such discharge was for the purpose of saving life or preventing immediate loss of a ship or was caused by damage or unavoidable leakage, if all reasonable precautions were taken to minimize the discharge or was a discharge from the bilges of a ship containing only lubricating oil. Steamship Inspection Service were authorized to go aboard any ship within Canadian waters and investigate the circumstances of any alleged discharge with a view to determining whether a prosecution should proceed. These regulations are published in SOR/68-434.

During the telephone discussion Mr. Strang and the Chief Inspector, Mr. Forsyth, discussed the report that the ARROW was in no immediate danger and the weather conditions at the time. Mr. Strang was advised of the possibility that the ship may float off on the next high tide due at about 6:00 p.m., and since there had been no report of oil leakage to this time the two men agreed that nothing

further should be done at the moment.

Shortly after, however, Canso radio monitored a conversation between the pilot boat and the ARROW indicating that the ARROW was leaking oil into the sea, on her starboard side. This information together with the opinion that the ship appeared to be firmly aground was relayed to DOT Halifax and the Coast Guard Rescue Coordinating officer. Canso radio made radio contact with the ARROW at 3:50 p.m. and asked if she required assistance. The answer was "not at this moment will call if I do."

The word of the plight of the ARROW was beginning to spread to many parts of the world. In Greece, at the office of the owners' agency in Piraeus, Captain Demetrius Vlismas, the Chief Port Captain of that company, saw the message notifying them of the grounding. He later received further word from their operating office in Monte Carlo. In Halifax, shortly after three, Mr. Donald Kerr, Q.C., was advised of the grounding by the ship's agent at Sydney, who knew that Mr. Kerr normally represented the English Protection and Indemnity Associations under which the ARROW was entered. He immediately cabled his client and indicated that he was investigating the grounding. Mr. Kerr then proceeded to make contact with people at Imperial Oil, the Department of Transport and Mr. Walter Partridge who was associated with Mr. Kerr in a salvage company known as Atlantic Salvage Limited. Also at Halifax John A. Dalziel of the Federal Department of Fisheries, heard the news reports of the grounding about this time. He is the head of the pollution section of the Resource Development Branch. This Branch concerns itself with the effect of various pollutants on the fisheries resource of the Maritimes and conducts negotiations with industry and others in an attempt to abate any such pollutants. No action was considered necessary at this stage. At 4:00 p.m. William

O'Connell of Imperial Oil Limited at Halifax was advised of the grounding of the ARROW with Imperial's cargo aboard and that the vessel was expected to float off at high tide. The report he received indicated just slight leakage. Mr. O'Connell was the area distribution manager for the company, and he received this report from the Transportation Department. He is also the chairman of the Action Committee for the Atlantic Region under Imperial Oil's Oil Spill Contingency Plan. This plan had been set up in 1969 by the company to provide action committees throughout Canada, made up of senior executives in each area to work in liaison with a central committee in Toronto to deal with any oil spills caused by the company. Mr. O'Connell held himself available for action as soon as further information came forward.

In the New York office of Central American Steamship Agency, the American agent of Olympic Maritime at 4:00 p.m. the senior port Captain, Captain Patrinos advised Port Captain Georgios Yfantides of the particulars of the grounding. A report from Captain Anastassopoulos had been received to the effect that there was no immediate danger and had been no escape of oil. This message must have been passed to New York some time earlier because Captain Anastassopoulos in his testimony stated that he had observed some oil coming from the starboard side during the afternoon and had reported it to Canso radio.

At 4:15 Mr. Hornsby, who had been out of town, returned and called his Halifax office. He was advised of the grounding of the ARROW and what had taken place by Mr. Forsythe, his Senior Steamship Inspector. He was also given the same information indicating no immediate danger, that the ship was expected to float off at high tide and that there were no reports of pollution. Mr. Hornsby considered the matter was in hand and did nothing further that day.

Mr. Partridge of Atlantic Salvage heard of

the grounding from Mr. Kerr late in the afternoon. He then busied himself in an attempt to obtain the salvage contract for the vessel.

In Toronto, at the head office of Imperial Oil, at 4:15 p.m. the grounding was brought to the attention of G. K. Whynot, the General Manager of the Transportation Department of Imperial Oil Limited. He had received a call from Mr. Grout, the Marine Division Manager at head office, who advised him that the ARROW was carrying their cargo. Mr. Whynot immediately contacted Mr. Harvey Clare, the Chairman of the Environmental Quality Committee of Imperial Oil Limited, who was also in charge of the oil spill contingency plan of the company.

At 5:25 p.m. Canso radio monitored a message from the ARROW to the pilot boat asking for immediate assistance to remove her crew. Canso radio then made direct contact with the ARROW and were advised that the ARROW "required immediate assistance if need arises to disembark crew - ship now in worse condition." The SHEDIAC BAY overheard the call for assistance on the distress channel and contacted Canso radio to ask if there were any other ships in the area as she was small and the wind was high and it would be difficult to assist the ARROW. The reply was that the NARWHAL was available. Captain Young of the NARWHAL heard the distress call as well and by six o'clock was leaving his anchorage and heading out into Chedabucto Bay.

At 6:40 p.m. it was reported in the Canso radio log that the ARROW had now turned a hundred degrees to port, was rolling but still aground, and at 7:12 p.m. the ARROW asked the pilot boat to advise its agent that she was still firmly aground. The Captain of the ARROW at 7:15 p.m. made contact with the NARWHAL, which was two and a half miles away and asked that she come closer, since conditions in the vicinity of Cerberus Rock were becoming worse and during the

evening communications between the ARROW and other ships in the area and shore stations continued. At 9:06 p.m. the ARROW advised the pilot boat that she was still aground and rolling on the rocks. A reply indicated that a tug was on its way and expected to arrive within three or four hours. At 9:35 p.m. the ARROW advised the NARWHAL that conditions were worse and asked her to come very close in case it was necessary to abandon ship. The NARWHAL was then about two miles south of the Rock. The Captain of the ARROW advised the NARWHAL that there were 34 men on board and the NARWHAL remained in the vicinity to render whatever assistance was necessary.

While the ARROW was struggling to free herself from the Rock in the darkness of Chedabucto Bay, things were happening elsewhere. Mr. O'Connell had a long discussion with his superiors in Halifax and it was agreed that he should go to Port Hawkesbury to look into the situation. He left by car at ten that evening. Meanwhile Mr. Kerr and Mr. Partridge were still thinking in terms of salvage as no report had been received indicating the seriousness of her condition. They had been approached by the Salvage Association to undertake the salvage of the ship on the terms of Lloyd's open form, and were checking the availability of tugs in the area.

At 10:30 p.m. Mr. Langley received a message from the ARROW indicating that the crew were leaving the forward end and going to the aftersection of the ship. They were in fact abandoning the wheel house and asked that the LADY MOOD stand by. The Captain of the SHEDIAC BAY overheard this message and since he had his full crew aboard at Port Hawkesbury and was better equipped to handle the sea, headed directly for the ARROW. On the way out he could see the lights on the ARROW after he passed Eddy Point. There was quite a high swell at the time and the wind had shifted slightly to westerly. He took the SHEDIAC BAY in close and

removed three men, but in the course of doing so he had damaged his vessel. Fortunately at this time the barge from the NARWHAL arrived, which was a more suitable vessel for the removal of further members of the crew.

By midnight Mr. Kerr was advised by Mr. Logan of the Salvage Association that Marine Industries Ltd. of Halifax had entered into a Lloyd's open form arrangement with the owners for the salvage of the vessel and this brought Mr. Kerr's interest to an end as far as a possible salvage operation was concerned. He continued meetings throughout the night with Mr. Partridge and others in his capacity as a representative of the owners and insurers under TOVALOP and felt that he had authority to deal with the prevention of pollution at the site. Reports of oil leaking from the ship had been received by Atlantic Salvage divers earlier and arrangements were made to send the Atlantic Salvage tug BIJOU to Port Hawkesbury with spraying equipment and forty drums of an emulsifying agent which was provided by the P. & I Clubs. Mr. Partridge and his son, along with several divers, left by truck with additional equipment and arranged to meet their other two divers from Sydney at Canso.

CHAPTER 3

FEBRUARY 5, 1970 - THURSDAY

EVERYONE LEAVES THE SHIP - SOME RETURN

By the time the SHEDIAC BAY had taken off the three crew members it was already 2:00 a.m. on the 5th. The ARROW was listing to port and her condition was becoming dangerous. At 2:25 a.m. when the NARWHAL called the ARROW Captain Anastassopoulos advised that the situation was worse and more dangerous, that the deck was awash and the ship was listing to port. The NARWHAL asked the best position to come in to remove further men and whether or not she should send in the barge now, and Captain Anastassopoulos asked to send it in as soon as possible. The efforts to remove the remainder of the crew continued through the night and by 3:57 a.m. the SHEDIAC BAY reported that she had 21 men aboard. A request for a doctor to be brought to the wharf at Port Hawkesbury to attend one of the men with a broken arm was passed on to the pilot as well as the following information: "No, not breaking up water washing over deck, don't think there will be anything to salvage. We have enough food to give men breakfast, they are very tired, some appear to be suffering from shock, so think it would be advisable to have doctor for first aid."

Shortly after 4:00 a.m. Captain Anastassopoulos advised the chief engineer to go full astern again and after that to put out the fires. He felt that he couldn't leave the boilers with steam in them.

By 6:17 a.m. of the 5th, the Captain and all 34 members of the crew had been removed from the ARROW. The last group were removed by barge and taken to the NARWHAL. All lights were off, steam had been let go and no person

remained aboard the ARROW. The Captain had been reluctant to leave with remainder of his crew but deteriorating weather conditions convinced Captain Young of the NARWHAL that everyone should be removed from the ARROW and he sent his barge in for this purpose. He spoke to Captain Anastassopoulos and persuaded him to leave the ship as the opportunity to remove the Captain and the crew would disappear if the winds got any higher. It was after this final conversation that everybody left the ARROW.

The men who braved the elements to effect this rescue during very adverse weather conditions are to be congratulated for the success in completing the rescue without loss of life or serious injury. They are also to be commended for their bravery.

The NARWHAL with Captain Anastassopoulos and the remainder of his crew on board then proceeded towards Port Hawkesbury. On the way they met the LADY MOOD just west of Eddy Point and transferred the crew to the pilot boat. They were then taken ashore.

The ARROW remained firmly aground on Cerberus Rock as daylight reached Chedabucto Bay. She was unmanned and exposed to the action of the wind and the sea. Her engines were silent and her steam had been let go and the 16,000 tons of Bunker "C" fuel oil in her tanks was beginning to cool. The weather had improved and although there was some mist and the sea was rolling, it was generally fair. Only the forward end of the ARROW was aground and the stern was afloat. Her foredeck was completely awash as she was down heavily in the bow.

After disembarking the crew into the LADY MOOD, the NARWHAL returned to Cerberus Rock and checked the position of the spar buoy marking the hazard. It was found to be on station.

At 8:15 a.m. Mr. O'Connell arrived from Halifax, to have a first hand look at the situation. He arranged to fly over the wreck by helicopter about 9:00 a.m. and describes the scene as follows: "I saw a vessel that appeared to be well aground, it was down at the bow with seas breaking over the forepart. The seas weren't too rough, but they were washing right over the deck, and there was an oil slick about the width or rather the length of the ship and it would appear to me to be extending somewhere between four and five miles to sea." It appeared to be coming right from the ship.

About the same time Mr. Partridge arrived at Canso with his son and a diver Fleming Vemb, and their load of equipment. They met their other two divers who had arrived from Sydney and made arrangements to charter the herring seiner LYNN KATHLEEN to take them and their equipment out to the ARROW.

By this time Captain Vlismas in Greece had had further reports indicating the seriousness of the developing situation and he called Captain Patkinos in New York and arrangements were made to send Captain Yfantides to Port Hawkesbury.

Frank Weston, the Regional Director of Marine Services for the Department of Transport, arrived at his office in Dartmouth at 8:30 that morning and saw the telex from the Rescue Coordination Centre advising of the grounding and that the crew had been removed. There was no indication of any escape of oil in the message. Shortly after he received a call from Mr. Hornsby advising that Mr. Strang had already been sent to Port Hawkesbury and after some discussion it was agreed that Mr. Hornsby should proceed there as well. He took along a witness who was to give evidence at a hearing at Canso and arranged for Mr. Strang to meet him there so they could go and view the wreck and check any breaches of

the oil pollution prevention regulations. Before nine Mr. Weston had a call from Imperial Oil at Halifax asking for helicopters to take two men to Port Hawkesbury and he arranged to recall one from the South Shore and made it available to them.

Gordon W. Stead, the Assistant Deputy Minister Marine, Department of Transport, heard of the grounding by radio at his home in Ottawa, early on the morning of the 5th. As soon as he arrived at his office he contacted Mr. Weston to see that the people responsible in the area were on top of the problem. The only legislative responsibility which his department exercised was the enforcement of the oil pollution prevention regulations made under the Canada Shipping Act, which had been administered by the Steamship Inspection Service of his department. Even though the legislative authority was limited to the prosecution of breaches of the regulations, and there was no legislative appropriation to provide funds for oil pollution situations, Mr. Stead had been successful in the past in cases of relatively minor spills in encouraging those responsible to move in and clean up any oil pollution. It had been his practice to use the persuasive powers of his office to "cajole" owners and cargo-owners into taking whatever action was necessary to meet an oil spill situation. He did this by making it clear to them that it was their responsibility, their problem, but that the government was prepared to assist in any way with resources and materials to keep the situation under control. It was with this background in mind that Mr. Stead, after having discussed the developing situation with Mr. Weston, received a call from the head office of Imperial Oil in Toronto.

At head office of Imperial Oil the previous day, although the report was to the effect that the ship was in no difficulty and would probably get off the Rock in the evening, precautions were taken in case it did not turn out

that way. The policy of the company in these situations was to act as best they could to lessen pollution should an oil spill develop through the activities of the company or one of its associates and when the potential of the spill was realized, action was commenced. Distribution of dispersant cargoes to the area was arranged and the chairman of the Regional Oil Spill committee, Mr. Belshaw, of Halifax, was alerted and people were directed to Port Hawkesbury. By eight or nine o'clock the previous evening Mr. Clare had been advised the ship did not get off the rock and this triggered the activities of the oil spill committee and sent Mr. O'Connell on his way to Port Hawkesbury. Early on Thursday morning Mr. Belshaw reported the situation to Toronto advising that the crew had been removed from the ship and that the IMPERIAL ACADIA, a ten thousand ton dead weight tanker, had been ordered to proceed to Chedabucto Bay to lighten the cargo of the ARROW, should this become possible and desirable. It was decided that it would be helpful if Mr. Whynot went from Toronto to Halifax to back up Mr. Belshaw and his regional committee, and this was arranged. Captain Davison was to accompany him as an advisor.

As soon as Mr. Clare heard the reports of the oil slick, he realized that Bunker "C" oil in cold water could become quite a mess. Immediate arrangements were made to beef up the amount of expertise available at the scene of the spill as well as the equipment that may become necessary. Dr. Kilpert, from the Esso Research Centre, an expert in dispersants, and John Gray, a company engineer from Sarnia, with experience in pollution control, were dispatched to the scene. Arrangements were made to charter light aircraft to spray dispersants on the slicks and substantial supplies of Corexit 866 were shipped for this purpose. Unfortunately the company had no experience with the use of Corexit as a dispersant in low temperatures and there was much uncertainty as to the

toxic effect of its use.

Searches were made to locate booms that could be used for containing oil slicks and as the size of the possible pollution incident became more apparent, arrangements were made for the manufacture of more dispersant at the company's refineries.

Mr. Clare next contacted their affiliate in New York who had chartered the ARROW and asked them to obtain the approval of the owners of what they were doing and this approval was obtained. Although Imperial considered it had a moral responsibility to clean up the spill, Mr. Clare wanted to be certain that the owners approved of their activities because of the necessity of eventually straightening out the legal responsibility for what could become a very expensive operation.

As the morning went on and more information was reported concerning the escape of oil from the wreck and the potential of the situation became greater, Mr. Clare realized the need for an expert in the field of marine biology to advise at the scene. He attempted to contact Dr. Molly Spooner, a well known British biologist, who had done extensive work following the major spill of oil on the South coast of England from the TORREY CANYON two years earlier. At that time chemical dispersants had been used to break up the oil on the water and on the beaches and it was subsequently discovered that the emulsification of the oil and the dispersant produced a toxic effect on marine life. New dispersants such as Corxit 866 had been developed by Imperial Oil since that time, but not enough was yet known of their toxicity in order to justify their use in locations where a major fishery existed. Dr. Spooner was not available but Mr. Clare was able to locate Dr. Richard E. Warner of Memorial University in Newfoundland, who was dispatched to the scene.

It was during the early hours of Thursday

morning that Mr. Stead was in contact with the head office of Imperial Oil and heard of the implementation of their contingency plan. On behalf of the government, he offered them every assistance, including helicopters, in their efforts and encouraged them to take all steps necessary to minimize the pollution threat.

At 10:30 a.m. Mr. Partridge and his divers arrived at the ARROW. He understood that he was acting on behalf of the underwriters at the time. They boarded and Mr. Partridge knew as soon as he stepped aboard that "she was finished, she was a constructive total loss as far as the hull was concerned." He describes the ship as follows:

"She was leaking oil forward, she was down very heavy by the bow, her foredeck was completely flooded and some of the afterdeck after the centre decks was flooded. We - after going through the vessel and finding the vessel abandoned with not a soul aboard, we proceeded to open most of the ullage ports on the after deck and we found that most of the tanks were ruptured. They were open to the sea."

They noticed that the oil was still extremely hot but the steam had been let go. Although the weather had improved considerably, Mr. Partridge did not feel that it would have been possible to bring a vessel along side the ARROW for the purpose of pumping the oil out. He stayed on board for about a half hour and then called Mr. Kerr from the LYNN KATHLEEN and reported the situation to him. It was agreed that he should go to Port Hawkesbury, locate the ship's engineers and persuade them to return to the ship so that steam could be raised in preparation for an off-loading operation, and Mr. Partridge left his divers aboard and proceeded to shore for this purpose. On the way, they passed the LADY MOOD but did not realize that Captain Anastassopoulos and the Chief Engineer of the ARROW were aboard and returning to their ship.

Earlier that morning the Chief Engineer of the ARROW had been in direct conversation with Marinos

Costeletos, a naval architect, who was the technical manager of Olympic Maritime (SA) of Monte Carlo. Mr. Costeletos had arrived in New York on February 2nd on a business trip and while there, was advised of the grounding of the ARROW by Captain Patrinos of the New York agency, Central American Steamships Corporation. The conversation took place while the Chief Engineer was still ashore. Notes made at the time by Mr. Costeletos indicate that he was advised as follows: The time and place of the grounding; a description of the contents of each tank; turned 140 degrees to the right by the weather after grounding; leakages of oil in 3 and 4 starboard; 5 and 6 starboard took water; list to port of 6 to 7 degrees averages now 8 to 10 degrees; now water to centre line; pivoting about 5 centre; up to 6 under water possibly sagging; engine secured about 5:00 a.m. on the 5th; boilers warm; bunkers 130 degrees F, 3 foot tide, crew O.K.; 50 tons distilled water; plenty of diesel; emergency diesel O.K.

Having received this information, Mr. Costeletos decided to try to locate copies of plans of the ship from the American Bureau of Shipping Offices in New York and spent the remainder of the day doing so.

After Mr. Kerr had received the report from Mr. Partridge concerning his survey of the ship, he immediately contacted Captain Thibault in charge of the marine department of Imperial Oil at Halifax and was referred to Mr. Belshaw. Mr. Belshaw made it clear to Mr. Kerr that Imperial Oil was merely carrying out its responsibilities as a good citizen in an emergency and didn't consider that it had any legal responsibility for the spill. Both agreed to cooperate with each other and to keep each other informed. Then Mr. Kerr ordered in another 80 drums of Hemco, the type of dispersant he was familiar with, from New York and made arrangements to leave for Port Hawkesbury himself. Before leaving, however, he arranged for the dispatch of the tugs IRVING BEACH and IRVING SHARK in

Saint John and the IRVING MAPLE enroute to Newfoundland to Chedabucto Bay.

By noon, Captain Anastassopoulos, his Chief Engineer and Second Engineer had reboarded the ARROW. They found the Atlantic Salvage divers on board. At about the same time Captain Roger Marsham was arriving at Canso. He was a nautical services officer attached to the investigation section of the Department of Transport and he had journeyed from Ottawa to carry out an investigation of a shipping casualty in the area. A message awaiting Captain Marsham advised him to call his office and when he did he was instructed to conduct a preliminary inquiry into the grounding of the ARROW.

By noon Ottawa time Mr. Stead had acquired a substantial amount of information concerning the situation at Chedabucto Bay and he reported on what had happened and what was being done by Imperial Oil and D.O.T. forces to the Minister of Transport.

When the Captain of the ARROW had been aboard for a short while he decided to send the Chief Engineer back to Port Hawkesbury to get the members of the crew who were willing to reboard for the purpose of making steam. Although the Captain claimed not to have seen much escape of oil when he boarded the ARROW it was becoming quite apparent that substantial amounts of the cargo were escaping from the ship at the time. The Fisheries vessel SABELLA reported heavy black oil in the area of the wreck and several Fisheries officers had discovered oil on the shore at Guet Point on the North shore of Chedabucto Bay early in the afternoon.

Imperial Oil had been flying off some planes from Trenton airport and spraying some of the oil slicks with Coxexit but this was not proving effective and further flights were cancelled, on advice from Mr. O'Connell, the following day.

Barry Strang arrived at Canso about two o'clock and met Captain Marsham there. They were joined by Mr. Hornsby

at 3:30 p.m. and after a quick review of the situation a call was placed to Mr. Weston. It was agreed that they should hire a boat and go to the wreck and they proceeded with this plan. A fishing boat was located and they left for the ARROW arriving about 4:45 p.m. Shortly after Mr. Hornby's call, Mr. Weston received a call from the Commander of Maritime Command of the Canadian Armed Forces offering the Department of Transport any assistance which they may require. The news reports of the situation in Chedabucto Bay were sounding the alarm very effectively and all people in responsible positions were beginning to realize the gravity of the situation. While Mr. Hornsby and his associates were heading towards the ARROW, Mr. Whynot and Captain Davidson arrived from Toronto and overflew the Bay in their company aircraft. They observed a luminous oil slick as wide as the length of the ship and extending several miles to sea. They returned directly to Halifax where they met with the Imperial Oil committee that was functioning there.

As Mr. Hornsby neared the ARROW they encountered quite extensive slicks of oil on the sea. It was fairly rough and the spray was filled with oil coming generally from the area of the ship. The main slick seemed to be blowing out to sea. They boarded the vessel after explaining to a watchman who they were. The Captain was located and Captain Marsham conducted his initial interview concerning the grounding of the ship. Mr. Hornsby and Mr. Strang carried out an inspection of the wreck and immediately came to the conclusion that salvage of the ship as an entity was impossible. The forward end was aground and waves were washing over the forward deck. The light was fading and it was difficult to make a thorough survey at the time. Mr. Strang, however, stuck his head in the engine room which was dark and observed that there was no steam. They also noticed a list of seven to eight degrees and that the ship was six to seven degrees down

by the head. A short while after they had been on board the LYNN KATHLEEN arrived along side with Mr. Partridge whom they knew as the president of Atlantic Salvage Limited. It was Mr. Partridge's intention to attempt to raise steam and since there was nothing further to be accomplished on board, Mr. Hornsby and his party returned to Canso. From there they journeyed to Port Hawkesbury where Mr. Hornsby took a room at the Viking Motel.

While Mr. Hornsby and his party were inspecting the ARROW, Mr. Kerr had arrived at Port Hawkesbury, having travelled from Halifax by car. He had reached Port Hawkesbury about five p.m., met with Mr. Partridge who briefed him on the situation and advised him of the oil escaping from the ship and then made an effort in cooperation with a Mr. Westlake of Imperial Oil Limited to round up the engineers of the ship and return to raise steam. This was accomplished and Mr. Kerr, Mr. Partridge, Mr. O'Connell, the Chief and Second Engineer of the ARROW and two Atlantic Salvage divers left for the ARROW about 8:30 p.m. arriving there before ten, boarded and commenced the necessary steps to raise steam in the ship's boilers.

When Mr. Kerr arrived he was acting in a dual capacity. He was under instructions as solicitor for the P. & I. Associations to do whatever could be done to prevent pollution, and he was personally interested in Atlantic Salvage Limited. It was after dark when he boarded and the ARROW had a substantial list and her foredeck was under water. The water was three feet deep on the port side and one foot deep on the starboard side and formed an irregular wedge on the main deck. The foredeck was completely under water four or five or six feet. The ship was completely dead and the Master was the only one on board. He had the galley stove on and an oil lamp; that was the only light and heat aboard. Mr. Kerr checked the ullage ports that he could reach and found that number 9 and 8 and 7 wings were sound, but that

7 centre was breathing tremendously, indicating that it had been holed. Every other tank on the ship appeared to be tidal as well. He immediately concluded that the ship was unsalvageable as a unit.

Mr. Kerr saw oil in the water but couldn't determine where it was coming from, and since it was at night and the ship was without power, no further inspection could be made. All of those on board went down into the engine room and although there wasn't much communication between them because of the language differences, it was apparent there was a common intention to raise steam on the vessel. The ship's engineers selected the port boiler and went right to work cutting the fuel line, adapting it to a line from a diesel tank in order to get diesel fuel in to start up the furnace and generate steam. The effort to raise steam continued until 4:00 a.m. the following morning when it was successful. The process of raising steam was a long and tedious one, especially in the dark of the engine room. Fuel had to be pumped into the boilers by hand and oily rags ignited. The ship's engineers and Atlantic Salvage people worked very hard so that steam could be raised in order to operate the ship's power and pumps for the possible off-loading of its remaining cargo, and the heating of the cargo as well.

During Thursday evening, while those on board the ARROW were attempting to raise steam and Mr. Hornsby and his associates were getting established at Port Hawkesbury to keep an eye on the situation, Mr. Whynot of Imperial Oil was meeting with his people at Halifax. Reports were being received on the ETA of the IMPERIAL ACADIA on the shipment of chemicals and booms to the area and a great deal of activity was taking place. Captain Thibson, who had been sent to Port Hawkesbury, called that evening to bring the group up to date on the local situation and advised them of the efforts being made aboard the ARROW to raise steam for

the possible off-loading operation.

Before Mr. Kerr and his party left for the ARROW earlier that evening he had met with Mr. Hornsby and Mr. Strang while they were having dinner at their motel. Mr. Kerr, of course, and Mr. Partridge were both known to Mr. Hornsby and he knew of their business association in Atlantic Salvage Limited as well. Mr. Kerr informed Mr. Hornsby that he had been appointed the TOVALOP representative and had the responsibility for preventing pollution from the ARROW. When Mr. Hornsby indicated he was not familiar with the TOVALOP organization, Mr. Kerr passed him a document explaining its purposes and then advised him that the Atlantic Salvage people were going out to the ship that evening to raise steam in the ship's boilers so that there would be power to drive the ship's pumps in order to off-load the oil into a barge or tanker as soon as possible. Mr. Kerr then mentioned that on a previous occasion Mr. Hornsby had been instrumental in obtaining the services of a Canadian government helicopter and he asked if he once again would intervene in order to make available a heavy lift helicopter to assist in the operation.

Shortly thereafter Mr. Hornsby contacted the Chairman of the Board of Steamship Inspection in Ottawa and advised him of the request for helicopter assistance and was told that one could be requisitioned if he felt it was necessary.

Although Mr. Hornsby and his assistant Mr. Strang had come to Port Hawkesbury merely to carry out their duties under the oil pollution prevention regulations, it was becoming apparent that a unique situation was developing in Chedabucto Bay. Since Mr. Hornsby was the senior Canadian government representative there, he felt that he should remain there pending future developments. He talked with Captain Finch of the M.I.L. tug FOUNDATION VALIANT. This was the company that had obtained the salvage contract on Lloyd's

open form and had come to Port Hawkesbury for that purpose. Mr. Logan of the London Salvage Association was with Captain Finch at the time. After a discussion of the events up to date, Captain Finch invited Mr. Hornsby to join him in a trip to the ARROW the following morning so that a detailed inspection of the condition of the ship could be made, and Mr. Hornsby agreed. When Mr. Hornsby returned to his room he had a chance to examine the document concerning the TOVALOP organization handed him by Mr. Kerr. He discovered that this was an organization set up subsequent to the TORREY CANYON disaster in England by the leading tanker owners of the world to provide funds for the cleanup of pollution caused by oil spills from ships that are members of the group. The amount payable was limited to a fixed number of dollars per dead weight ton of the ship causing the spill and was only payable to national governments or recoverable by the owner of the offending ship that expended funds for purposes of cleanup. This knowledge must have brought some comfort to Mr. Hornsby because he would then realize that the presence of Atlantic Salvage Limited at Chedabucto Bay under Mr. Kerr's direction meant that there would be someone there with an interest in preventing pollution and the financial resources to back up that interest. He had already been advised, of course, that Imperial Oil was there out of a sense of moral obligation to do whatever they could to lessen pollution as well. Up to this time of course the role of a representative of the Canadian government was only a limited one and as the threat of pollution increased and a need for action became more apparent and the persuasive role of government more unsatisfactory, the fact that all forces in the vicinity were pulling in the same direction was merely a fortunate circumstance based upon the desire of all concerned to cooperate to prevent a calamity.

Mr. Hornsby completed his activities for that day at eleven o'clock when he called in his report to his superior Mr. Weston at Halifax. He advised him of the oil reported escaping from the ship and of the activities that were taking place, and the various people who had arrived at the scene.

CHAPTER 4

FEBRUARY 6, 1970 - FRIDAY

ATTEMPT TO RAISE STEAM AND OFF-LOAD CARGO

The effort to raise steam in the ARROW was meeting with success during the early hours of Friday morning. At about three a.m., Mr. Kerr left the ship and boarded the LYNN KATHLEEN alongside after a few pounds of steam had been raised but not enough to power any of the ship's equipment. While he was there he heard the escape of steam and went back on board to find out what had happened. The Chief Engineer advised that he had lost water in the boiler for some reason and it had been necessary to let the steam go. An examination revealed that not only the boiler was empty of fresh water but the gravity feed tank above it as well, and it would be necessary to pump water from the fresh water tanks in the after peak of the ship before steam could be attempted again. Since there were no pumps aboard, Mr. Kerr and Mr. Partridge decided to go to Port Hawkesbury about 5:00 a.m. and obtain the necessary equipment. When they reached the Port Hawkesbury Motel at 7:00 a.m., they met with Mr. Hornsby and Captain Marsham of the DOT and Captain Thibault and Captain Davidson of Imperial Oil. The question of responsibility for further pollution came up and Captain Davidson drafted a form which he asked Mr. Kerr to have signed in order to determine this responsibility. Nothing was done about this document, however. Mr. Kerr also contacted Captain Finch because he felt that a salvage operation would be incompatible with the minimizing of pollution. After this discussion Captain Finch wanted to go out in daylight and take a thorough look at the wreck before making his decision. Mr. Kerr and associates then rounded up the pumps and equipment necessary to make a second attempt at raising steam and returned to the ARROW. Before doing so,

however, he made a specific request for a helicopter which Mr. Hornsby passed on to Mr. Weston and sent a long cable to his principals to bring them up to date on the situation at Chedabucto Bay.

Captain Yfantides had arrived at Port Hawkesbury at 1:00 a.m. that morning and met with the local agent of the owner, Mr. McInnis, at five. Arrangements were made by Mr. McInnis to charter the LADY MOOD for his use and he left for the ARROW at nine by himself.

An hour earlier the FOUNDATION VALIANT had departed for the wreck with Mr. Hornsby, Mr. Strang, Captain Marsham, Mr. Logan, Captain Davidson, Captain Thibault and some photographers aboard. This was the trip that had been planned the night before by Captain Finch and was made for the purpose of a thorough inspection of the ARROW.

Mr. O'Connell remained behind at Port Hawkesbury and continued with the task of lining up all materials and supplies that were becoming necessary for the job that lay ahead. He considered that he was working as an employee of Imperial Oil Limited in doing so and that he was carrying out the task that had been assumed by his company. He observed the effects of some air-spraying of Corexit that morning and advised Halifax that all further attempts should be called off, as it wasn't doing any good. His main concern that morning was directed towards the fish plants since reports had come in of oil reaching the shores of Arichat, and every effort was made to obtain suitable booms and straw to counteract this impending danger to the water supply of the fish plants in the area.

The Atlantic Salvage men were the first to return to the ARROW that morning. They took the pump down to the after peak and made arrangements to pump fresh water into the boiler and the gravity feed tank. Mr. Kerr made a

quick inspection of the hull and observed a wrinkle starting on the starboard side at number 5 tank. A short while later the FOUNDATION VALIANT arrived and the representatives of the Department of Transport, Imperial Oil, the Salvage company and the Salvage Association came on board. The next to arrive was Captain Yfantides in the LADY MOOD. Most of those already on board were busily engaged in the after section of the ship in trying to pump fresh water to the engine room, and the various visitors began to inspect the condition of the ship. Captain Yfantides inquired of Mr. Strang twice as to the whereabouts of Captain Anastassopoulos before he located him and they reviewed the ship's predicament and took soundings to determine the characteristics of the sea bottom around the ship. Although Captain Yfantides had not seen, according to his testimony, any oil escaping when he boarded, the other visitors had and they soon discovered its source. Mr. Kerr was located and arrangements were made to attempt to stop several of the leaks where oil was obviously flowing into the sea. The party went forward on the catwalk over the main deck and to the starboard side of the bridge-house. They couldn't proceed further because the foredeck was under water, but they could see a hole in the hatch coaming over number 4 tank which was gushing a stream of oil about the size of a man's arm, and they could also see holes in the vent pipe which ran above the tanks under the forward deck. As the sea washed over the foredeck spurts of oil could be seen coming from the vent pipe and flowing into the water. An attempt was then made by one of the Atlantic Salvage divers to plug these holes and although he was able to insert wedges in the hatch coaming, of number 4 tank, his attempts to plug the vent pipe with wedges were unsuccessful. The pipe would not stand the wedges and would break when they were hammered in and since the diver was working in the water against the action

of the waves, he was unable to continue his efforts for too long and the attempt was abandoned. The diver had been almost carried overboard on several occasions and to continue would be to jeopardize his safety.

Mr. Hornsby and Captain Finch and Mr. Logan continued their survey of the ship and reached the conclusion that she definitely was not salvageable as a unit. She appeared to be broken since there was some slight movement of the stern independent of the bow and all agreed that the only sensible thing to do under the circumstances was to lighten the cargo into another ship. Mr. Kerr explained that this could be done from the tanks that were still intact and that other tanks, which were holed and in which the oil would be floating on the surface, would create a problem. He felt, however, that this oil could be transferred above deck to one of the good tanks and pumped from there. This plan, of course, required that the vessel be able to raise steam and maintain the action of her pumps and that a lightering vessel be available. The IMPERIAL ACADIA was just arriving in Chedabucto Bay for the purpose and the IRVING SEARK and IRVING WHALE were on their way.

Attempts to make steam were continuing but new difficulties were encountered. When Mr. Kerr returned to the afterend there was a sudden alarm raised about the level of water in the engine room which had reached a point only three inches below the cofferdam. Had the water been permitted to spill over the cofferdam into the electric pumps all hope of pumping the cargo with the use of the ship's equipment would be lost. The pump which had been brought aboard to transfer fresh water was brought to the engine room and two hours of pumping required to bring the water level back to a safe position. Then the task of raising steam was once again resumed. The pump was returned to the after peak and it was expected that water to the boilers would be restored by nine

o'clock that evening, at which time attempts to fire the boilers could be made.

When it became the common intent of the group to raise steam and off-load the vessel and all necessary surveys had been completed, the visitors decided to return. At about 4:30 in the afternoon Captain Yfantides left the ARROW intending to round up as many members of the crew as possible to return to the ship and keep watch in the engine room when steam was on. Those who had arrived in the FOUNDATION VALIANT returned the same way leaving only Captain Anastassopoulos, his engineers, Mr. Kerr, Mr. Partridge and their divers on board.

In Halifax during that Friday the activities generated by the ARROW's grounding were continuing at a fast pace. Mr. Weston had received a request for a Sea King helicopter from Mr. Hornsby earlier that morning and he contacted Colonel Houser of the Canadian Armed Forces to expedite the request. A Sea King type of helicopter was not appropriate for use on land since dust and gravel may affect its operation and Colonel Houser decided to obtain a Labrador instead. He made arrangements to have one transported to Port Hawkesbury early Saturday morning from the Search and Rescue Squadron at Summerside, Prince Edward Island. Mr. Whynot at the Halifax office of Imperial Oil had been receiving reports of large oil slicks showing up on the Cape Breton coast. Realizing that it should be investigated, he arranged for a company aircraft to overfly the area and return to Halifax. A snow storm prevented this reconnaissance from being completed, and they were unable to establish the validity of the reports.

Concern over the effect of the oil spill on the fishery in the area was growing among the senior members of the Department of Fisheries and Forestry at Halifax by this time. Reports reaching the Halifax office had indicated

the presence of oil in the Bay and on the shores the previous day and that Imperial Oil was assuming full responsibility and was spraying the oil with Corexit on a small scale. Advisability of this procedure was discussed among Dr. John Sprague, Dr. R. Trites of the Fishery Research Board and Dr. Warner from Memorial University, and as a result biologist J. R. MacDonald of the Resource Development Branch and Dr. Martin Thomas of the Fisheries Research Board had been instructed to proceed to Chedabucto Bay so as to arrive there on February 6th. On that Friday morning the acting regional director of the Department of Fisheries and Forestry, Mr. C. P. Ruggles, contacted Mr. Weston of the DOT and Mr. Dalziel, the head of the pollution section, contacted Imperial Oil and a meeting was arranged for the afternoon. Mr. Whynot and Mr. Kilpert attended the meeting on behalf of Imperial Oil Limited.

At this meeting the responsibility of the Fisheries Department was defined and sensitive areas pertaining to the fishery were outlined. Burning and booming and chemical dispersing of the oil was discussed and arrangements made for continued liaison between Mr. Frank Belshaw of Imperial Oil and Mr. Dalziel of the Department, during the continuance of the salvage operations.

In Toronto, Mr. Clare had been keeping himself informed on the latest developments. He heard from Mr. Belshaw the reports of considerable pollution and increased his efforts to arrange technical expertise for the operation. He arranged for a shipment of a large quantity of "sea beads", a new combustion agent, to the area and for representatives of the Pittsburgh Corning Company to go to Port Hawkesbury and supervise burning experiments. As the afternoon progressed, Mr. Clare began to feel that there may be an opportunity for confusion at the site since the roles of the various participants were not clearly defined.

He called Mr. Stead, the Deputy Minister, and suggested that section 495 (c) of The Canada Shipping Act be proclaimed, which authorizes the government to take complete charge of a wrecked vessel that is posing a pollution threat and that Imperial Oil be appointed the agent of the Crown on the scene since they had the greatest number of personnel there at the time. He felt that this would overcome some of the legalistic problems that were arising in the minds of the many people involved in the operation at the time. Mr. Stead agreed to discuss this with the Minister and to let Mr. Clare know later on that day.

In New York, Mr. Costeletos was successful in obtaining copies of microfilmed plans of the sister ship of the ARROW and some other information concerning her structure. He then made arrangements to fly to Port Hawkesbury and to bring with him Captain Vlismas who was arriving from Greece that evening. Captain Vlismas is in charge of the personnel on all the ships of the fleet. Their flight arrangements allowed them to reach Port Hawkesbury by the following morning.

Late Friday afternoon Mr. MacDonald, the Fisheries Department representative, visited the vicinity of Cerberus Rock in the SHEDIAC BAY. He observed a heavy oil slick moving downwind from the middle of the ARROW 300 yards wide and three-quarters of a mile in length. The slick was filled with heavy patches of oil one inch thick and six feet in diameter. Another slick was observed two miles long and to the west a third slick a quarter mile wide and two miles long with heavy patches of thick oil was measured by radar as well.

When Mr. Hornsby returned to Port Hawkesbury he called Mr. Weston and reported on the activities of the day. He also confirmed that the helicopter would be available in the morning and advised of the plan to raise steam and lighter the ship.

In Ottawa Mr. Stead recommended the invocation of section 495 (c) of the Canada Shipping Act to the Minister once he was certain that no possibility of salvage of the ship existed, and arrangements were made by the Minister to make the declaration that evening. When Mr. Stead later spoke to Mr. Clare, however, no mention was made of the declaration but the Deputy Minister merely expressed his alarm at the serious pollution reports that were coming in. He wanted action and asked Mr. Clare to do whatever was necessary in order to alleviate the situation. Glass beads were discussed as a burning method and Mr. Clare was asked to go ahead with this as an alternative to off-loading. It is not clear what was in the mind of the Deputy Minister at the time but Mr. Clare says that he was even prepared to blow off the deck and burn the oil in the ship with the beads as a drastic attempt to overcome the problem. But this procedure never filtered through to those in the front lines. Mr. Clare also says that he assumed that he was acting as agent for the Crown and that he had a sort of verbal agreement with Mr. Stead.

It was after this discussion between Mr. Stead and Mr. Clare that Mr. Stead had a further conference with the Minister of Transport and it was finally decided that section 495 (c) should be proclaimed. The announcement was made later that evening.

Work continued all night in the attempt of those on board the ARROW to raise steam. By 9:00 p.m. sufficient water had been restored into the boilers to allow them to be fired. A request had been sent through to have Imperial Oil provide for four or five competent marine engineers to assist with the steam raising process and Mr. Whynot was attempting to comply with this at the Halifax end. By 10:30 p.m. Mr. Kerr and Mr. Partridge decided that the steam raising seemed to be well in hand and they would go ashore

expecting steam and lights to be on by three or four the next morning. They left their divers to continue assisting the ship's engineers in this activity.

As soon as Mr. Kerr came ashore he met with Mr. Hornsby. Mr. Kerr expressed the view that the foreward section of the ship could not be salvaged in any way but that the after part might be floated if it could be separated with the assistance of explosives. There still was, however, the possibility of raising steam and off-loading the cargo and both agreed that this was the best plan to pursue in order to avoid further pollution.

The need for explosives was passed on to the Imperial Oil representatives by Mr. Hornsby later, since they seemed to be the ones assuming the responsibility for providing the necessary materials to assist in the operation. Mr. Hornsby did not consider that he was in charge at this stage. It was a case of separate but equal entities working in cooperation with each other.

Eight inches of snow fell during the evening and the weather was generally bad. Captain Yfantides had rounded up ten members of the crew who were willing to return to the ship to assist with the raising of steam and wanted to take them out that night. Mr. Kerr advised against this because of the weather conditions and the fact that the ship was still dark and the pilot boat brought the possibility to an end when it reported that the weather was too bad for the trip. He decided to wait until morning when Captain Vlismas and Mr. Costaletos were scheduled to arrive and take the crew to the ship on the LADY MOOD at that time.

CHAPTER 5

FEBRUARY 7, 1970 - SATURDAY

THE ARROW BREAKS HER BACK

By 3:00 a.m. after many many hours of strenuous effort, the Chief Engineer of the ARROW and those assisting him were successful in raising steam, and reports from people on shore indicated that the ship's lights were on. As dawn broke the many people now gathered at Port Hawkesbury began to pursue the tasks best suited to their capabilities. Mr. O'Connell chartered the VALIANT to conduct an experiment using surface application of Corexit. Air spraying had been unsuccessful because the Corexit had not been mixed with the oil on the sea to permit emulsification. The surface experiment would use the tug to churn up the mixture to see whether the dispersant would be effective under these cold water conditions. Booms were beginning to arrive from Montreal and Boston and others were being constructed.

Mr. Kerr met with Mr. Hornsby, Captain Marsham, Captain Davidson and others to plan activities for the day. Mr. Hornsby reported that a helicopter would be available and was expected about 9:00 a.m. The IMPERIAL ACADIA had arrived at noon the day before and the plan was to do everything necessary to lighten the oil from the ARROW as soon as possible. Mr. Partridge left on the LYNN KATHLEEN for the ship and dropped Captain Davidson at the IMPERIAL ACADIA on the way. Mr. Kerr remained ashore and rounded up the equipment that was necessary for the off-loading operation, intending to take it to the ship by helicopter as soon as it arrived. Mr. Hornsby and Mr. O'Connell made plans for the placement of the booms that were arriving at Port Hawkesbury at the fish plant sites which required helicopter assistance as well.

Mr. Whynot left Halifax by car with Mr. Kilpert

and Mr. O'Brien of New Jersey Chemicals with plans to conduct control tests with Corexit in a boomed area. Mr. O'Connell had also received word that glass beads were being shipped and experts sent from the Pittsburgh Corning Company to conduct burning experiments and he made an arrangement with the local Shipyard to construct special booms out of oil drums for this purpose.

It was also necessary to establish a means of communication between the wreck and the shore so that the people on board could pass on their requirements directly to Mr. O'Connell. He was able to arrange this by acquisition of walkie-talkie equipment which would permit communication to the R.C.M.P. Station at Arichat and from there by phone line to Port Hawkesbury.

At 8:00 a.m. Dr. Thomas arrived as the official representative of the Fisheries Research Board of Canada. Dr. Thomas is a specialist in the marine cultivation of estuaries and shallow waters and his main interest was in the effect of the oil pollution on the marine life of the intertidal zone. He had been asked, however, to assist with a survey of the effects of the oil on plankton, the basic feeding material of marine life in the sea, as well.

After Mr. Partridge had dropped Captain Davidson off at the IMPERIAL ACADIA that morning and headed for the ARROW he was pleased to see smoke coming from her funnel. On arrival, however, he was shocked to find that the steam which had been raised during the night had been let go and what he had just witnessed was the burning of oily rags only. Partridge was naturally upset and confronted the Chief Engineer for an explanation. He was told that the steam had been shut down because the Chief Engineer and Second Engineer and other men working to raise it were exhausted and unable to maintain watch, but that this did not make any difference since steam could now be raised within two hours when

required. While their conversation continued Mr. Partridge suddenly heard a terrific bang and a violent shudder of the ship. This meant to him that the ship had broken her back and he rushed to the deck to check. A quick sighting revealed that the stern section was moving independently of the bow. While the bow remained stationary the stern section was going up and down and sideways. There was no doubt in the mind of Mr. Partridge that the ship was broken.

It was now 9:00 a.m. and Mr. Kerr arrived by helicopter bringing with him six marine engineers provided by Imperial Oil. He was immediately briefed by Mr. Partridge on the situation and conducted a quick survey of the ship. He found that the ship was working right across number 5 tanks and that the wrinkle in the hull previously observed had increased. Mr. Kerr decided that the situation had deteriorated to a point where it was unsafe for men to remain in the engine room and he ordered it vacated.

A diver was put over the side to check the condition of the hull and he discovered that the entire bottom and both sides of the hull were cracked up to within five feet of the sheer strake, which meant that the ship was merely hinged by its deck plates. At this time the ship was running broad sides to the sea and it was apparent to Mr. Kerr and Mr. Partridge that in a matter of time the stern would be separated from the bow by the action of the sea and this posed the possibility of breakup of the stern section on the Rock and further pollution. They contacted their architect, Maurice Evans, in Halifax, and reached the conclusion that they would break the ship themselves by use of tugs so as to control the destiny of the aftersection.

At about the time Mr. Kerr arrived on board the ARROW, Captain Yfantides had assembled ten members of the ship's crew at the dock at Port Hawkesbury intending to proceed to the ship on the LADY MOOD. He was joined by Mr.

Costeletos and Captain Vlismas who had just arrived and wished to visit the ship immediately. As they were about to leave Mr. Westlake of Imperial Oil told them of the news of the breaking of the ship, which meant, of course, if true, that the cargo could not be pumped and there would be no need for the crew to return to the ship. It was quickly decided that Captain Yfantides, Mr. Costeletos and Captain Vlismas would proceed to the ARROW on the FOUNDATION VALIANT and the crew would remain on the dock to be transported to the ship later by helicopter should their presence be necessary. The owners' representatives wanted to check and see whether it would be safe to attempt to raise steam and conduct a pumping operation before returning the crew to the ship.

The VALIANT circled the ARROW before they boarded and Captain Yfantides felt that the condition of the ship had not changed from the previous day. None of the owners' representatives on board noticed any substantial oil slicks on the way out but they did notice some leakage from the port side. They boarded and met with Captain Anastassopoulos and the Chief Engineer and talked with Mr. Kerr as well. Mr. Costeletos said he found that the ship was not ready to off-load oil to the IMPERIAL ACADIA in the vicinity as there were no hose connections and no power or steam on the ship. He was advised that steam had been raised the night before but had been let go because of the exhausted condition of the crew. He was assured, however, that steam could be raised within a two-hour period and felt that there may be some misunderstanding between the ship's crew and the Atlantic Salvage people about this. After observing the conditions under which the engineers had been working for so many hours, he accepted their explanation as being reasonable and proceeded to make an inspection of the condition of the ship.

Mr. Costeletos did not feel that the ship had been broken to a point where it would be impossible to raise

steam or pump off the cargo. He explained that the breaking of the ship's back is a gradual thing and in his opinion it had not progressed to the point where off-loading was impossible. His associates agreed with him and even though a certain amount of danger would be experienced by the crew in attempting to work the ship, the risk would be worth taking in order to accomplish their purpose. Mr. Costeletos and Captain Vlismas then left for shore to round up the crew and took with them the Second Engineer who had become very ill. Captain Yfantides was left to assist Captain Anastassopoulos on board.

Early that Saturday morning, Mr. Weston was invited to spend the day at Mr. Belshaw's office in Halifax since the main committee would be working from that post. His own offices were not staffed on Saturday and since so many requests for material and assistance were being made to various government departments and could only be approved with his authorization, he readily agreed. During the day he kept Mr. Stead advised of developments as they were reported to him, as he understood from Mr. Stead that Imperial Oil were acting as agents for the Crown. This, he had been told, was as a result of the TOVALOP agreements with which he himself was unfamiliar, and he understood that Imperial Oil Limited would be making all major physical commitments at the site.

In Toronto when Mr. Clare arrived at his office early that Saturday morning, he met with Richard Grout, the company's marine manager. The first reports they received were very optimistic in that steam had been raised and the IMPERIAL ACADIA was standing by and the weather was favourable. By noon, however, the report came in of the crack across number 5 and that the stern section was only being held by the deck plates. This information was passed on by Mr. Grout to Mr. Stead in Ottawa and then Mr. Clare and Mr. Grout made arrangements to leave for Port Hawkesbury as quickly as possible.

At Port Hawkesbury Dr. Thomas and Mr. MacDonald met briefly at noon with Mr. Hornsby and then proceeded to Mr. O'Connell's room to discuss their reservations concerning the use of dispersant. At this time Mr. Strang, who had previously returned to Sydney, arrived back on the scene and Mr. Whynot and Mr. Kilpert arrived from Halifax. They had been disturbed on the way up to hear on the car radio a news broadcast to the effect that the Minister had ordered the ship and its cargo to be destroyed. But when they were briefed by the Imperial Oil people on the spot no such instruction had come through. Mr. Whynot was flown over the Bay by helicopter and saw some light oil on the surface and in the coves around Janvrin Island. He talked with some fishermen who said they knew of shore contamination but did not see any polluted shores on this trip.

By two o'clock Mr. Whynot had met Mr. Hornsby for the first time and after a short discussion the group headed by helicopter for the wreck. They were accompanied by Messrs. Logan, Marsham, Strang and some divers. Mr. Kerr showed them the bulge that had developed at the sheer strake on both sides near number 5 tank and advised of the crack coming close to the deck. It was apparent to both Mr. Hornsby and Mr. Whynot that the ARROW's back had been broken and it would no longer be possible to carry out the plan to off-load the ARROW by use of its own pumps.

Mr. Hornsby had brought Mr. Whynot to the ARROW to meet Mr. Kerr so that he could be made familiar with the status of the wreck and while there the escaping oil from number 4 hatch coaming and the vent pipe was pointed out to him. Mr. Whynot says that Mr. Hornsby told him it was imperative that he stay as the senior Imperial Oil man on the scene because he understood that the Minister had nominated Imperial Oil to take action. Although Mr. Whynot had not received any such instructions from his office he did agree to remain and act under the direction of Mr. Hornsby as the senior government

man on the spot.

They returned to Port Hawkesbury and Mr. Whynot introduced Mr. Hornsby to Mr. O'Brien and Mr. Kilpert, who explained to him the planned experiment for burning the oil by using sea beads. The need to develop a fire proof boom for this purpose was pointed out and the efforts of Mr. O'Connell to produce one. Messrs. Whynot and Hornsby then discussed the plight of the stern section of the ARROW. Once it was realized that the pumping capability of the ARROW would not be available to lighten the cargo and that the pumps on the IMPERIAL ACADIA were not suction pumps, the original plan had to be abandoned. The IMPERIAL ACADIA was released to return to Halifax. In its place portable pumps had to be provided and the problem of steam to heat the cargo for the pumping operation was considered. Mr. Whynot determined that the IMPERIAL CORNWALL stationed at Halifax could be used as a satellite to provide steam when necessary, but that this ship was only licensed to operate in Halifax Harbour. Mr. Hornsby then contacted Mr. Weston and asked that special arrangements be made by the Steamship Inspection Service to permit the IMPERIAL CORNWALL to leave for Chedabucto Bay and this was quickly accomplished.

By this time Mr. Webster of Canadian Industries Limited, the explosives expert, had arrived and he was instructed in the possible requirements of explosives to assist in the separation of the two parts of the ship. Some calls were made to the fish plants to check on the progress of booming there and the meeting then broke up for supper.

During the afternoon the tugs IRVING MAPLE and IRVING SHARK arrived and Mr. Kerr and Mr. O'Connell had started the assembly of the necessary gear for breaking the ship the following day. While this was going on, Dr. Thomas visited the ARROW and found large pans of oil, very thick, heading seaward from the ship. These pans were fifty feet in diameter.

He carried out two plankton tests along the edge of the main slicks and obtained control samples away from the wreck, and although there was no apparent evidence of destruction of the plankton, there were oil droplets in the samples.

Back on shore, Captain Vlismas was busy rounding up the crew of the ship and with some persuasion obtained agreement of ten of them to return to the ARROW the following morning. Mr. Costeletos spent some time discussing the condition of the ship with Mr. Logan, who by now had reached the firm conclusion that the ARROW was unsalvageable and so advised his principals by telegram.

At 6:00 p.m. Mr. Maurice Evans, the naval architect of Atlantic Salvage Limited, arrived and took a room at the Viking Motel. He met Messrs. Hornsby, Marsham and Strang in the dining room and had a general discussion with them about the ARROW as he hadn't yet had a chance to talk to Mr. Kerr or Partridge who were still aboard ship. Mr. Hornsby's main concern to Mr. Evans at that time was the pollution of the shores. During the evening Mr. Evans couldn't find any plans of the ship so he talked to Mr. Kerr by RT and asked him to bring in the ship's capacity plan when he came. During this conversation Mr. Kerr advised of the difficulty experienced aboard the ship with raising of steam and so he sought out the Greek naval architect, Mr. Costeletos, to find out the difficulty. Mr. Costeletos couldn't understand why there was a problem and spoke directly to Captain Yfantides and the Chief Engineer aboard the ARROW to obtain the explanation. They told him that the steam had been let go last night simply because the engineers couldn't maintain it on a continuous basis in their exhausted condition and that it could be raised again within two hours if required. Mr. Costeletos was still of the opinion that steam could be raised and the cargo off-loaded

by using the ship's pumps and so arrangements were made to take out the crew the next morning. Since this was contrary to what Mr. Kerr had advised, Mr. Evans called Mr. Hornsby and invited him to come to his room to review this information. Mr. Hornsby invited Mr. Whynot, Mr. Strang and Captain Marsham to join the group and Mr. Whynot brought Captain Davison as well. Mr. Strang was there and Mr. Kerr arrived later.

Mr. Costeletos repeated his opinion that it was possible to raise steam and off-load the cargo of the ARROW and it was agreed that they would proceed to the wreck in the morning to see whether the crew could be returned to the engine room in safety, and if so, this plan would be followed. Mr. Costeletos gave an indication that steam could be raised within five hours but Mr. Kerr pointed out that the diesel fuel on board was contaminated and a new supply would have to be taken to the ship if steam were to be raised. Arrangements were accordingly made to transport diesel fuel to the ARROW in case it should be required. Mr. Hornsby was obviously pleased with this turn of events because, if what Mr. Costeletos said was true, it meant that the cargo could be off-loaded even though the stern had to be separated from the bow, and off-loading was the best method of avoiding further pollution. He, of course, had not been too directly connected with the pumping problem and this was why he had called Mr. Whynot in. At this point he still considered Mr. Whynot to be in charge of the entire operation acting as the Crown's agent and that his role there was still that of an observer with a limited function for enforcing the oil pollution regulations. When Mr. Hornsby returned to his room, however, there was a message to call Mr. Stead and it was at this time that he was first advised of the Minister's proclamation being issued under the authority of section 493 (c) of the Canada Shipping Act. That section is as follows:

"495 (c) (1) Where the Minister has reasonable cause to believe that the cargo or fuel of a vessel that is in distress, stranded, wrecked, sunk or abandoned

(a) is polluting or is likely to pollute any Canadian waters,

(b) constitutes or is likely to constitute a danger to water fowl or marine life, or

(c) is damaging or is likely to damage coastal property or is interfering or is likely to interfere with the enjoyment thereof,

he may cause the vessel, its cargo or fuel to be destroyed or removed to such place, and sold in such manner, as he may direct.

(2) The proceeds from the sale of a vessel or the cargo or fuel of a vessel pursuant to subsection (1) shall be applied towards meeting the expenses incurred by the Minister in removing and selling that vessel, cargo or fuel and any surplus shall be paid to the owner of that vessel or cargo.

Although this proclamation had been made the previous evening, Mr. Stead had been unable to make contact with Mr. Hornsby and it was not until 10:30 on Saturday evening during this phone conversation that Mr. Hornsby was advised of any new function he was to perform at Port Hawkesbury. The Deputy Minister told him that he was to act as the senior departmental representative at the site and that he would have complete authority to do whatever the department felt was necessary to achieve the ends of section 495 (c). He would, of course, clear all major decisions with the Deputy Minister but it would be unnecessary to go through the usual chain of command in doing so. The direct relationship between Ottawa and its representative at the scene had been dictated by the pollution crisis which was developing so rapidly.

Whether or not the delayed notification to Mr. Hornsby of his new responsibilities had any bearing on the attempts being made to avoid further pollution is difficult to determine. The attitude which was in the minds of the government officials at the scene up to that time was that of an onlooker rather than a person in charge as there was a Liberian registered tanker with a Greek crew reputed to be a part of a Greek tanker fleet grounded on a rock in Chedabucto Bay. Only a limited government jurisdiction was felt to exist and under that jurisdiction attempts had been made to arrange for the plugging of some of the holes through which oil was escaping into the waters of the Bay. On the other hand, Atlantic Salvage Limited, representatives of the owners and insurers, were making every effort to remove the cause of the pollution from the tanks of the ship and Imperial Oil Limited had sent their forces to the scene to assist in any way possible to contain and clean up their cargo which was the pollutant.

The owner's naval architect had by this time persuaded all of the cooperating parties that the cargo could still be pumped from the wreck by using the ARROW's equipment and they had determined to proceed to the ship in the morning to make certain that such an operation could be conducted in safety. No one could really take issue with this approach as Mr. Costeletos by his qualifications and association with the ship was a person whose opinion should command the respect of those less qualified at the scene. The other naval architect, Mr. Evans, engaged by Atlantic Salvage Limited, had just arrived that evening and had not had an opportunity to make a personal inspection of the ship but rather busied himself accumulating as much information from those present as possible and reviewing the suggestions being made by Mr. Costeletos. The owner's naval architect was satisfied with

the explanation given him by the Chief Engineer of the ship as to the raising of steam and asserted that it could, in his opinion, be raised within a short period of time. He also felt that the cargo could be pumped by the ship's pumps after his inspection of the vessel and Mr. Evans was in no position to disagree with these conclusions. Subsequent evidence which I shall deal with later casts substantial doubt, however, on the opinion of Mr. Costeletos. It will tend to show that the conclusions reached by Atlantic Salvage personnel and Mr. Hornsby earlier that day to the effect that off-loading was impossible by use of the ARROW's equipment were correct, and that all efforts should have been directed towards an off-loading scheme contemplating the use of portable pumps.

During the latter part of Saturday night and into the small hours of Sunday morning many small meetings and discussions were taking place. The word was spreading that the Canadian Government had stepped in to take command of the situation and this was having its effect. Mr. Costeletos called Captain Yfantides at the wreck by RT and advised him that the government had by proclamation assumed responsibility for the wreck and that the owners were no longer in charge. He also advised him of the decision reached at the meeting to come to the ARROW in the morning to determine whether or not it was safe to work in the engine room. The crew and the diesel fuel necessary for pumping operations would be transported to the ship should it become necessary. Mr. Costeletos then woke Captain Vlismas and advised him of the government take-over and that they would have no further responsibility. They agreed to meet at 6:00 a.m.

Mr. Evans had a long meeting with Mr. Kerr and Mr. Partridge which dealt mainly with the planned breaking of the ship the following day. Until actually seeing the ship Mr. Evans was not in a position to make a final decision

as to this requirement but the many alternatives were considered.

Mr. Clare and Mr. Grout arrived in Halifax Saturday evening and joined a meeting of their regional oil spill committee. Mr. Weston, the senior DOT representative, attended as did Mr. Farrell Boyce, an oceanographer from the Canada Centre of Inland Waters at Burlington and Mr. Castelluchi, of the Pittsburgh Corning Company. Arrangements were made to fly these people to Port Hawkesbury the following morning by DOT helicopter.

The Canada Centre for Inland Waters at Burlington, Ontario, had heard of the grounding of the ARROW on February 4th but felt that the situation was well under control as Imperial Oil Limited had assumed responsibility and the Department of Transport were keeping an eye on the situation from the point of view of the Oil Pollution Regulations. By Saturday, they were becoming alarmed by the news reports emanating from Port Hawkesbury and decided to dispatch two of their people to provide technical assistance and advice in the cleanup operations. Mr. Boyce had left that day and their environmental quality coordinator, Dr. FeFeuvre was to fly down Monday morning.

CHAPTER 6

FEBRUARY 8, 1970 - SUNDAY

THE SEPARATION OF THE STERN AND PLAN TO REFLOAT HER

As agreed the previous evening, Captain Vlismas and those members of the crew who were prepared to return to the ship met Mr. Costeletos for breakfast at the Viking Motel. Mr. Costeletos had arranged to take a group of people out to the ARROW on the LADY MOOD to make the necessary checks of the vessel and the crew remained ashore until this had been accomplished.

Mr. Kerr and his associates left for the ARROW very early that morning. They had spent most of the night discussing the breaking of the ship and what would happen to the stern section after the breaking operation was completed. Their plan was to commence at high tide about 9:15 in the morning. Tentatively they had been making plans for what would be done in the event the stern section should float at an angle which would permit it to be towed and had discussed taking it 400 miles to sea where it would be sunk off the continental shelf. If such plan materialized Captain Marsham was to be in charge of the accompanying vessel. Mr. Costeletos expressed the opinion that the stern section would float at an angle of approximately 45 degrees but Mr. Evans felt the angle would be much more substantial. Since the length of the stern section was over 200 feet this angle would determine whether there would be any possibility of floatation at all as the sea bottom around Cerberus Rock was only about 80 feet below the surface at high tide.

When Mr. Kerr arrived on board, the two tugs that were holding the ship in position were on the station. While awaiting high tide and the planned breaking operation, pumps were maintained in the engine room and a watch kept to

make sure that nothing bad was happening.

At 8:00 a.m. the LADY MOOD departed from Port Hawkesbury for the ARROW as agreed the night before. Aboard were Messrs. Hornsby, Costeletos, Evans, Strang, Whynot, Webster and Captain Vlismas. Mr. Costeletos had received a call from the ship the night before from Captain Yfantides indicating her condition was worse and that she was breaking. This was one of the reasons why the ARROW's crew had been left behind that morning until the wreck could be assessed. It was also one of the reasons why the LADY MOOD circled the ARROW before boarding. As she approached about 9:30 that Sunday morning, the weather was fairly good and visibility excellent. Those on board could see that the king posts had taken up a converging position and it soon became apparent to all that the ship was in danger of breaking. By the time they reached the ARROW the conclusion had already obviously been reached and Mr. Kerr was supervising final arrangements for the separation. No one argued with him at this point when he suggested it was too dangerous to place men in the engine room so as to commence pumping with the ship's equipment.

A quick inspection established that the stern section was only attached to the bow by the deck plates and the time was now ripe for breaking operations. In fact the action of the after section was so violent that all agreed it would be more sensible to adjourn to the LADY MOOD to complete their discussions. This was done and a firm decision made to break the ship. The method was to use the tugs to pull the stern from side to side until the deck plates broke. For more pulling power the owners' representatives suggested placing both tugs on one side during each pull and although this was eventually done the first attempt was made with a single tug pulling alternately in each direction.

Before the breaking operation commenced, a

minor flare-up occurred. Mr. Kerr wanted to be on board the stern section with his men during the operation to give directions to the tugs. Mr. Costeletos felt that if Mr. Kerr was to be aboard some of the owners' representatives should be aboard as well. His reasoning was that the ship might float if it should be broken in water deep enough and he did not want a piece of the ship floating at sea without a representative of the owner on board, especially when the after section still constituted a severe pollution hazard. Mr. Hornsby, who was now in charge, did not consider it safe for men to be on board during the breaking operation and insisted upon a commitment to this effect by Mr. Kerr. The commitment was, however, in the agony of the moment when everybody was under substantial pressure to proceed, disregarded by Mr. Kerr and he returned on board. When Mr. Costeletos saw what was happening he too insisted on returning to the ship and it was then necessary for Mr. Hornsby to take action. He prevailed upon Mr. Whynot to use his influence to have all men removed from the ship and when this failed, he instructed the tug captains that the operation was not to commence until his order had been complied with. Reluctantly Mr. Kerr and his men withdrew and conducted the operation from the LYNN KATHLEEN, which took station beside the wreck. Mr. Evans suggested that this altercation may have delayed the breaking of the ship for some time because the high tide at 9:15 was missed, but an overall look at the evidence indicates that the 9:15 tide would have been missed in any event. The LADY MOOD did not arrive at the ship until after the change of tide. The indications are that the breaking operations only took a matter of a few hours, some 60 manoeuvres being required. The after section came to rest about 150 feet from the bow, having broken at number 5 tank. The forward end of the after section was resting on the bottom in about 42

feet of water, while the stern was afloat, being held by the buoyancy of the engine room, pump room and other open spaces, at the after end of the ship. After the break she had settled down slowly and it was possible for the tugs, by continuing their pulling action in opposite directions, to walk the after section down the Rock to a solid fairly level sandy bottom.

Mr. Hornsby says that the decision to break the ship was not made until they assembled on the LADY MOOD at the scene that morning. He maintains that the trip was made just to check and see if the off-loading operation could continue. Many of the others concerned, however, had treated this possibility very lightly and had really expected a breaking operation to proceed. There was no doubt in Mr. Kerr's mind when he left for the ARROW that morning and Mr. Costeletos admits that he discussed the matter on the way out after having had the call from Captain Yfantides the night before. Mr. Evans, who had not seen the wreck before, realized immediately that the vessel could not be left in its condition.

Early Sunday morning Mr. Weston went once again to the Imperial Oil offices in Halifax to spend the day. Shortly after he arrived he received a report of the plan to break the ship from Mr. Hornsby and passed it on to Mr. Stead, who concurred. It was only at this time that Mr. Weston became aware that the Minister had invoked section 495 (c) of the Canada Shipping Act. Although he had not been consulted, he agreed with Mr. Hornsby's appointment as on-scene commander as he was the person with the most experience in the subject and was on location.

The break up of the ship caused further oil to be spilled into the waters of Chedabucto Bay. This further escape of oil became apparent to the many scientific

people who were now busily engaged in and around Chedabucto Bay. The whole area was being patrolled by fisheries officers looking for evidence of damage to marine life and keeping track of coastline fouling. They were keeping a special watch on the waters supply of the fish plants and making note of any damage to the local fishery.

Mr. Clare, Mr. Grout and Mr. Castelluchi had left Halifax at 9:30 by helicopter. They overflew the wreck on the way and landed at Port Hawkesbury at 11:30.

After the break up operation, Mr. Hornsby, Mr. Whynot and Mr. Strang left the LADY MOOD and boarded the CGS RALLY and returned to Port Hawkesbury later that afternoon. Mr. Costeletos and Captain Vlismas returned on the LADY MOOD. Mr. Kerr, Mr. Evans and Mr. Partridge reboarded the stern section which then had a 20 degree forward tip and checked to see that everything was all right. A diver was put down but was almost killed when he became enveloped in oil, so it was impossible to check below the surface. Work was started on the doorways, ullage ports and ventilators while Mr. Evans discussed future possibilities with the other two. After rejecting many an idea, they reached the conclusion that it was possible to float the stern section by injecting air into some of the forward tanks and redistributing oil in the others. This plan would necessitate the release of some further oil from the ship, but if successful, would permit the removal of 90 percent of the remaining cargo from the Bay. With this plan in mind, Mr. Kerr contacted Mr. Hornsby on shore and asked that he arrange a meeting of all those people vitally concerned for that evening so that they could make their proposal to the group for approval.

When Mr. Clare had arrived at Port Hawkesbury at noon that day, he found the physical set up to be very unsatisfactory. There was only one telephone line into the

motel where Mr. O'Connell had his office set up and it was very difficult for him to maintain communications with all the persons involved. The government and industry representatives in the area were scattered throughout different motels and it was virtually impossible to even know who was present. This loose arrangement bothered Mr. Clare who was used to having an efficient organization to back up the decision-making process and he set about to put things right.

When Mr. Hornsby returned from the ARROW he was invited by Mr. Whynot to meet Mr. Clare and Mr. Grout in his room. Messrs. O'Connell, O'Brian and Kilpert were there as well. Mr. Clare indicated that he was the Imperial Oil representative now assigned to coordinate their operations at Port Hawkesbury. He had made himself familiar with those persons who were now engaged in the operation and suggested that he prepare an organization chart to assist Mr. Hornsby as the on-scene commander, with the many activities taking place. He offered his services to Mr. Hornsby as secretary of the organization and when this was acceptable, busied himself making better physical arrangements for their task. Since several people from his company had separate rooms in the Port Hawkesbury motel he was able to commandeer these facilities and make other arrangements for the occupants. By this method he managed to assemble space for headquarters operations which became available by the following day.

The LADY MOOD arrived at Port Hawkesbury about 6:00 p.m. Mr. Costeletos was apparently no longer speaking in terms of a pumping operation because Captain Vlismas sought out the crew, told them they were finished at Port Hawkesbury and arranged for their repatriation.

Mr. O'Connell had been very busy all day. Early in the morning they started placing booms at the Petit de Grat fish plant as there were reports of oil heading

towards Isle Madame. These reports had been sent by Mr. Whynot who watched the direction of flow of the oil escaping from the ARROW at the time of the break. The booms were constructed out of polyvinyl chloride with a two foot skirt underwater and a one foot skirt above the water, supported by floats. This type of boom was not really designed for the type of sea conditions being experienced in the area and it was necessary to employ local fishermen to continually supervise the installation. A new type of boom was being constructed under Mr. O'Connell's direction at the local shipyards.

When Mr. Weston received a report of the completion of the breaking of the ship, he contacted Captain Finch of MIL to inquire about flotation pontoons. He felt that they may be of some assistance in a refloating plan but was advised that they were only available in the United Kingdom. He was also engaged in chasing down and locating the various types of equipment which were being requisitioned. Spray packs for use in some of the burning experiments to be tried were obtained through the Provincial department of Lands and Forests. Flame throwers that were requested were arranged through Colonel Houser of Maritime Command. Portable radios and other similar equipment were dispatched to the scene.

Before Messrs. Kerr, Evans and Partridge left the ARROW early that evening, they had reached the firm conclusion that the stern section could be floated by the acquisition of 600 tons of buoyancy. To accomplish this, it would have been necessary to remove the oil from the number 7 centre tank and then redistribute the oil in all of the other tanks so that air could be introduced in such a manner as to provide the required buoyancy. Mr. Partridge was so anxious to proceed that he wanted to remove the ullage port from number 7 that night while the wind was in a favourable

condition and let the contents into the sea in the expectation it would be carried out of the Bay. Mr. Kerr and Mr. Evans, however, would not permit this as they felt such a decision would have to be approved by Mr. Hornsby before this action could be taken. This is why they called him and asked for a meeting that evening explaining the general idea of their plan, and this is also why, when they left the ARROW that night, they brought two ullage ports with them so they could be altered at the shipyards to permit the attachment of compressed air hoses for the blowing of the contents of the tanks, when approval was obtained.

Shortly after this request, Mr. Hornsby made contact with Mr. Stead in Ottawa. He advised him of the breaking of the ship and of the fact that an off-loading operation was now impossible. They discussed Mr. Kerr's suggestion for refloating the stern section and Mr. Stead agreed that the sacrifice of 600 tons of oil into the Bay in order to save eight thousand was a fair exchange. He left it up to Mr. Hornsby who was then awaiting Mr. Kerr's return.

Earlier in the day Dr. Thomas and Mr. MacDonald had been unable to obtain the use of the Fisheries' vessel SHEDIAC BAY because they were told it had been seconded to Imperial Oil Limited for their purposes. It was impossible to get a phone line for an out call so Mr. MacDonald returned to Halifax to have the situation clarified. Dr. Thomas went to Isle Madame to make further observations of the shore line. When he returned to Fort Hawkesbury, Dr. Warner had arrived. They spent the afternoon with Mr. O'Connell discussing plans to control large pans of oil heading for shore and a plan was devised to spray them with Corexit from a Fisheries vessel the following day. That evening when Dr. Thomas returned to Halifax to discuss the plan with Dr. Dalziel, its use was discouraged because of the lack of

knowledge of the toxicity of the emulsion of Corexit and Bunker "C" oil.

On that Sunday evening about eight o'clock a large group of people began to assemble in Mr. Whynot's room at the Port Hawkesbury Motel. It was never an organized meeting but had been arranged as a result of Mr. Kerr's request. Mr. Whynot acted as chairman to the limited extent that anybody acted as chairman until Mr. Hornsby arrived and then from then on he was in charge. Those who attended from time to time during the evening hours were Messrs. Kerr, Evans, Partridge, Strang, O'Connell, Grout, Clare, Costeletos, Captain Davidson and Dr. Warner. Captain Marsham and three men from Pittsburgh Corning Company attended for a short while.

The meeting turned out to be a rather frustrating one to some of those who attended. Mr. Whynot had Messrs. Kerr and Evans explain their plan to float the stern section and how it involved the possible release of further oil. This turned into more of a discussion among groups than a meeting with many people talking at the same time. When Mr. Hornsby arrived, the explanation was given again. Then many groups began considering the various possible results of such an operation as they would affect their particular activity. Some discussed the materials and supplies required for the operation, others discussed the containment of the additional oil spill, others discussed the disposal of the stern section if it should become floated, but the Atlantic Salvage people who had come specifically looking for a firm approval of their plan so that they could immediately proceed, left the meeting with a feeling that this had been denied. The only evidence of denial was from reference to comments made by Dr. Warner and the scientific people against any further oil spill. But Mr. Kerr and Mr. Partridge came away with the distinct impression that permission had been refused. Mr. Evans does not recall anyone forbidding Atlantic Salvage

Limited to proceed but in view of the vociferous objections raised by the scientific people, felt it was obvious that they were not going to get the decision to go ahead.

Mr. Hornsby felt that the plan had been accepted by the meeting and he says that he himself accepted it, of course, with some reservations. These reservations were based upon the fact that detailed calculations had to be completed before the question of floatability could be finally determined, and these calculations had not yet been completed. He thought, however, it was a feasible plan. They had brought the capacity plan with them and Mr. Evans had agreed to make these detailed calculations. Once the plan was proven to be feasible, then and only then would Mr. Hornsby consider the release of the oil necessary for its success, and in the meantime he would make arrangements with the environmental personnel to control and destroy if possible the additional oil being discharged. He also had a reservation about the location of the tow should the refloating take place. Mr. Kerr and the people he represented wished to tow the stern section directly to sea and dispose of it, but Mr. Hornsby felt that it might be better to take the stern section to Port Hawkesbury for off-loading at the refinery or to a sheltered cove where its cargo could be controlled. These were matters which remained open for consideration. With these reservations expressed to the Atlantic Salvage people, Mr. Hornsby felt that preparations for the plan would proceed, and others attending the meeting came away with the same impression.

Mr. Whynot listened to the plan being explained and reached the conclusion that it was the only thing to do and a good plan. He felt that Mr. Hornsby had given his approval although some details had been left open. It was generally agreed that there was from 7 to 8 thousand tons of oil remaining in the stern section and that about

ten percent of this would be lost during the refloating scheme. He felt that everyone was very conscious of the requirement of this deliberate oil spill and had weighed the deliberate loss against the safe removal of the bulk of the cargo. Nobody liked the thought of a deliberate spill but they agreed it was a necessary trade.

Mr. Strang also felt that the decision of the meeting was to proceed with the plan. This view was shared by Mr. O'Connell as well and he obtained the list of materials from Mr. Kerr necessary for the operation. The Imperial Oil people agreed to obtain these materials as soon as possible. One large compressor required for the operation had in fact already been obtained, which was an indication that Mr. Kerr had made a request for this equipment even prior to the meeting. There did not appear to be any doubts in the minds of any of the Imperial Oil forces that the plan was to proceed.

Mr. Costeletos listened to the proposed plan and considered it to be an excellent one. He says that he expressed his views to the meeting and tried to impress upon everyone present how important it was to proceed with the utmost haste to its completion. His recollection was that Mr. Hornsby was neither for nor against the plan and he did not recall any specific approval being given. Mr. Clare attended the meeting for a while but did not pay too much attention to the discussion. He realized the meeting was not being chaired as a meeting and doesn't recall whether a firm decision was made or not to proceed. He busied himself instead with the setting up of an organizational structure for the future.

As the meeting broke up more than three hours after it commenced, Mr. Evans buttonholed Mr. Hornsby at the door and tried to explain once again the feasibility of the plan. Mr. Hornsby was quite surprised to learn that Mr. Evans and the others from Atlantic Salvage felt that he had not

approved the plan. He says that he reaffirmed his approval and told Mr. Evans to proceed with his calculations, to determine the angle of float, the trim, and draft and the deck strength of the ship. Mr. Hornsby then directed that Mr. Evans be not disturbed until he had been able to complete his calculations which would in all likelihood take him through the night. Mr. Evans admitted that at this later conference he had obtained qualified approval for Atlantic Salvage to proceed with the floatation plan, but argues that the failure of Mr. Hornsby to give a clear and distinct go ahead previously delayed the operation. They had not taken the ullage ports to the shipyard that evening but waited instead until the following morning to arrange for the conversion of the ullage ports for the pumping operation.

There was in my opinion an unfortunate misunderstanding among those who attended the informal meeting that Sunday evening. The Atlantic Salvage people honestly felt that the approval they had sought to proceed with their plan had been refused. Mr. Hornsby and the Imperial Oil people thought that the plan had been approved and was to proceed with some reservations concerning the execution of the operation. Atlantic Salvage expected to receive clear and specific approval and Mr. Hornsby assumed that they would interpret what was said and done at the meeting to amount to that. It must be remembered that this was the first day that Mr. Hornsby was the on-scene commander and the first meeting at which he was expected to exercise control. Up to this time he had been observing decisions being made by Atlantic Salvage and Imperial Oil without actually participating in the formulation of these decisions. Furthermore, he was a rather soft spoken person without the domineering type of personality that may have been necessary to convince the Atlantic Salvage people that the loud objections being raised by the scientific personnel were to be rejected. Now

that the government had assumed command some of those present may have been looking for strong militaristic type of leadership rather than the sound but cautious approach assumed by the person whom circumstances had cast in an unfamiliar role.

Mr. Clare was a man with a great deal of experience in the executive field who possessed sound knowledge of decision making techniques. The need for a form of organization was apparent to him as soon as he arrived and became even more apparent after he had had a chance to observe that first informal meeting. Late in the evening he discussed the possible breakdown of the various tasks being undertaken by those present and it was agreed that he would be responsible to produce a chart setting up a proper organizational structure and assign the persons most qualified to positions of leadership under Mr. Hornsby as the on-scene commander. Meetings would be held of the management group each morning to plan the activities for the day and each evening to assess what had been accomplished and make plans to follow. Mr. Clare would act as secretary and be responsible to see that the decisions made by the management committee were passed on to the appropriate part of the organization for execution.

Late Sunday evening Mr. Hornsby had a call from a Mr. Tomkins, an English lawyer, claiming to represent the owners of the ARROW. He indicated that there were some legal problems to be discussed concerning the wreck and sought an interview for this purpose. Mr. Hornsby advised Mr. Tomkins that he had no authority to give any legal commitments and suggested that he consult the members of the Department in Ottawa instead.

Even though Mr. Kerr and Mr. Partridge had left the meeting and returned to their motel with the impression that their plan had been turned down, they were certain that it was the only viable plan that could be followed.

After discussing the matter with Mr. Evans and learning of the qualified approval given by Mr. Hornsby, they decided to proceed with preparations for the execution of the plan in any event. The list of materials was completed and given to Mr. O'Connell. Mr. Evans met with Mr. Costeletos to obtain as much information as possible from the materials and plans he had in his possession and then worked throughout the night to complete his calculations.

I do not believe that the reservations were in fact in any way unreasonable or would be the cause of any delay in the execution of the refloating scheme. The calculations had to be completed to determine in advance the draft of the stern section should the refloating operation be successful. This draft would determine any route through which she could then be towed and as I mentioned before, there were three possible destinations of such a tow but not enough time yet to determine the priorities of the various locations. The reservation which did not permit the release of any oil until the refloating operation was ready to proceed was also necessary. In the first place the introduction of air into the top of number 7 tank would force the oil in the tank toward the bottom. Number 7 tank was ruptured, however, somewhere near the bottom and the amount of water under the oil was unknown. During the pumping the water would be first released and it was difficult to determine as yet the extent of any eventual release of oil. Plans had to be made, however, to attempt to control any oil deliberately released by surrounding it with booms and burning it at sea if this method was proven feasible, or by mixing it with straw or other materials to make it easier to handle should it be blown ashore. All these possibilities had to be worked out.

It may very well be that the Atlantic Salvage people realized more clearly than they explained to others

that 600 tons of oil would have to be released in any event, even though they did not come from number 7 tank, and that they needed permission to do this during the period of preparation so as to make the buoyancy plan more certain. But if this were so, it was not brought home to those at the meeting and the reservation was sound.

CHAPTER 7

FEBRUARY 9, 1970 - MONDAY

PREPARING TO REFLOAT THE STERN SECTION

Mr. Kerr and Mr. Partridge worked through the night on the preparation of the list of materials required for the flotation operation and presented their requirements to Mr. O'Connell early in the morning. Mr. Hornsby had previously been advised that Imperial Oil Limited would continue to act as supplier to the operation and Mr. O'Connell busied himself assembling the equipment on the Nova Scotia Pulp Limited dock at Port Hawkesbury. Mr. Evans worked throughout the night on the detailed calculations being awaited by the on-scene commander. Dr. Thomas had left the previous evening for Halifax to confer with his colleagues on the use of dispersants. He returned through the night and arrived shortly before six intending to join the group who were to conduct an experiment with mass spraying of Corexit from a ship. He found no one at the dock and returned to his motel. At 6:00 a.m. Mr. Kerr took the ullage ports to Port Hawkesbury shipyards and arranged for them to be fitted with suitable nozzles to receive the compressed air in the tanks. He ordered extra ullage ports to be constructed with the equipment required for the buoyancy operation. Messrs. Kerr and Partridge completed their work ashore and then left for the ARROW. They spent the day there making the stern section water tight, pumping the water from the engine room and rigging life-saving equipment on board for the possible tow to sea.

At 9:00 a.m., Messrs. Whynot, Hornsby, Strang, Davidson and Marsham met and discussed the most appropriate disposal of the stern section once it should become refloated. The three alternatives were to tow it to Port Hawkesbury and off-load the remaining cargo at the refinery there, or to tow

it to a sheltered cove where it could be boomed off and off-loading arrangements made, or to tow it to sea if draft and trim would permit and sink the wreck and its cargo off the continental shelf. Captain Davidson agreed to do some chart research to determine whether a suitable cove existed and two possibilities were revealed. Mr. Hornsby and Captain Marsham discussed the alternatives with Mr. Stead in Ottawa and determined that the priorities were in the order in which I have just stated them. Captain Davidson was then assigned the responsibility for a detailed check of these options.

Mr. Hornsby then contacted Mr. Weston and brought him up to date with the plan to make the stern section towable.

After 10:00 a.m. Mr. Whynot came to see Mr. Hornsby to clarify the position of Captain Marsham. When Captain Marsham had completed his preliminary inquiry on Saturday, he would normally have returned to his office in Ottawa. Mr. Hornsby persuaded him to remain, however, and assume responsibility for the dispatch and use of the helicopter and shipping facilities made available to their organization. In a conversation with Mr. Whynot, Captain Marsham had said something which indicated that he was not under the direction and control of the Department of Transport and it was this situation that Mr. Whynot wanted clarified. Mr. Hornsby confirmed that Captain Marsham was now acting under his direction and the matter was resolved. I can only assume that the remark which disturbed Mr. Whynot and was not recalled by Captain Marsham may have been in reference to Captain Marsham's role as an investigator into a shipping casualty. When fulfilling that task he is required to maintain a separation from the DOT since he must sometimes determine whether any negligence of the Department caused or contributed to the shipping casualty.

By eleven o'clock Mr. Clare had presented Mr.

Hornsby with the organization chart he had drafted. He was able to advise that the persons named to fill the positions set forth on the chart had all agreed to act. Approval was immediately given by Mr. Hornsby and Mr. Clare embarked upon the task of making the organization work. Headquarters was immediately established in the space at the Port Hawkesbury Motel which he had been able to commandeer.

The organization was broken down into four main sections. Environmental, assigned to Mr. Dalziel of Fisheries and Forestry Department, Press, assigned to Mr. Hancock of Imperial Oil, Logistics, assigned to Mr. O'Connell of Imperial Oil and Captain Marsham for government, and the Ship, assigned to Mr. Whynot of Imperial Oil. The Environmental section was to deal with oil reconnaissance under Dr. Warner, burning under Dr. Lefeuve, spraying under Mr. O'Brien, booms, straw and clean-up under Mr. Kilpert, oceanography under Mr. Boyce and wildlife and fisheries unassigned. Mr. O'Connell was responsible for communication, transportation and materials, while Captain Marsham was responsible for helicopters, ships, divers and explosives. Mr. Whynot assumed responsibility for the pump-off, salvage and towing of the ship.

At this meeting early Monday morning, one matter that had to be determined was whether dispersants could safely be used. Dr. Warner was unable to advise whether the mixture of Corexit and oil would be toxic and recommended caution. Mr. Clare then asked him to arrange to conduct lab experiments to provide the answer.

Later in the morning Mr. Hornsby and Mr. Strang went to Arichat to check the reported shore pollution there. They also wished to observe an experiment to be conducted by the Pittsburgh Corning people to establish whether pools of emulsified oil and salt water could be burned with glass beads.

A good many of the people who had come to Port Hawkesbury arrived at Arichat to view this experiment. Dr. Thomas had reached Arichat on the SHEDIAC BAY intending to tow an oil drum boom across Arichat Harbour as an experiment arranged by Mr. Boyce. When he arrived he found the boom was not there so he went ashore and witnessed the glass bead experiment as well. Dr. Lefevre had arrived on Monday as planned and after he met Mr. Boyce and was introduced to Mr. Clare and Mr. Hornsby they travelled to Arichat to see the Pittsburgh experiment.

The results of the experiment were promising and Mr. Castelluchi was able to burn down pools of thick oil to ice level on the beach and to water level on the water. Most of those present were satisfied that oil on the shore could be burned with beads. The conditions under which the tests were made, however, were ideal and it remained to be seen whether burning could be successful on the open water or under higher wind conditions.

A large number of press photographers witnessed this experiment, some of whom removed the dead birds from the oil before taking their pictures. Others preferred more realism however, and placed the birds back in their oily death beds so that their film would show the scene as it was encountered.

On the return trip from Arichat Mr. Hornsby and Mr. Strang had a further discussion concerning the eventual disposition of the stern section of the ARROW. They were inclining towards the view that the sheltered cove would be the most suitable option and decided to make this recommendation to Ottawa. Before Mr. Hornsby had done so, however, he learned that Mr. Kerr was seeking a meeting of the management committee. Mr. Evans had completed his calculations and the meeting was arranged after lunch at 2:00 p.m. It took place in Mr. Evans' room at the Skye Motel

and Messrs. Hornsby, Marsham, Strang, Davidson and Whynot met Messrs. Evans, Kerr and Partridge there. Mr. Evans' detailed calculations were reviewed. He reported that without introduction of air the stern section would float at an angle of 79 degrees which would necessitate a draft of 200 feet. On the other hand, by introduction of six hundred to eight hundred tons of compressed air she would float on an even keel. It was further reported that the pump room and engine room were not secure and dry and that the stem was resting on the bottom with a force of 600 tons. The calculations were better than had been expected and it was agreed that the plan should proceed. Mr. Kerr and Mr. Partridge took the position that, after refloating, the stern section should be towed to sea, but this decision was reserved to be made after flotation was accomplished by the DOT. The reservation that no oil was to be released until the floating operation began remained, but Mr. Kerr says that they would have let the oil go as soon as they were ready.

The final decision to proceed having been made, Messrs. Kerr and Partridge returned to the ARROW to complete the readying of the ship for introduction of air. Mr. Hornsby reported to Mr. Weston and a further discussion of the alternatives of the two took place. By this time Mr. Stead had made known Ottawa's position with regard to the proposed tow to Port Hawkesbury. The condition was laid down that this option should not be followed unless ninety percent assurance could be given that it could be accomplished without further pollution, since the route to Port Hawkesbury would take it through a developed area. Under these conditions, Port Hawkesbury as the destination became only a remote possibility, leaving the other two alternatives to be further checked.

The Minister of Transport announced in the

House of Commons on Monday afternoon that he had proclaimed section 495 (c) of the Canada Shipping Act the previous Friday night, and stated that he had given directions that the wreck be removed or destroyed. He also made reference to the plan to tow the stern section to sea. As time went on this third option of towing to sea became the most feasible but the decision was still held in abeyance until after flotation had been accomplished.

After the meeting had concluded, Mr. Hornsby and Mr. Strang returned to Arichat to witness further burning tests with sea beads. Once again it was established that under certain conditions the oil would burn but it did not establish that it would burn at sea. This information was, of course, vital, so that plans could be made to burn the oil escaping during the refloating process should the burning technique be practical.

On the way back to Port Hawkesbury Mr. Hornsby suggested to Mr. Kilpert that he had read at one time of a chemical that would gel Bunker "C" oil. Mr. Kilpert had heard of this as well and agreed to check and see whether it was available.

When they arrived back at headquarters Mr. Clare reported that his inquiries at the oil refinery revealed that they did not have the capability of off-loading the fuel in the tanks of the ARROW, and this meant that the option of towing the wreck to Port Hawkesbury was out. During the afternoon Mr. Evans went to the shipyard to see what progress was being made with the construction of the ullage ports and to make certain that they were properly cut out and gasketed and fitted with the various bits of pipes and ducts required.

Mr. Costaletos met with Mr. Hornsby for the last time that afternoon to see whether he could be of any

further assistance. When he found that he was no longer required he took his leave and advised Mr. Hornsby that Captain Vlismas would be remaining at the scene.

Late in the afternoon when Messrs. Kerr and Partridge felt that all equipment had been satisfactorily installed and that the ship was secure, they returned to Port Hawkesbury. They decided to visit the wreck for a final check by helicopter by 6:00 p.m. When they returned to the ARROW they discovered that the lifeboat had been stolen from the ship. It was later found to have been taken by a boat from Port Hawkesbury and recovered. Other problems were experienced as well. It had taken four hours to make the engine room doors watertight. The environmental people were also at work that afternoon. A boom was placed in position at the Canso Tickle to protect the fish plant there. It was also one of the commercial variety not designed for these sea conditions and it was necessary to assemble log booms to protect the plastic booms from the weather.

At dinner that evening Mr. Tomkins came to see Mr. Hornsby. He very emphatically advised that the owners would agree to no alternative except the towing of the stern section to sea. When he was told that the destination of the tow would be determined by the DOT he declared that the owners considered this to be a takeover and wanted a letter absolving them of any further responsibility. Once again Mr. Hornsby advised Mr. Tomkins that he had no authority to enter into any legal commitments and that he should contact certain persons in Ottawa to resolve his problem. He offered to arrange an appointment with Mr. MacGillivray but Mr. Tomkins did not wish to take advantage of this accommodation.

About this same time a disagreement was developing between some of the scientific personnel. Dr. Warner felt that they were there to act as advisors and should be available to the management committee at all times for this

purpose. Dr. Thomas was of the opinion that they should be out in the field collecting information for the future. This disagreement was not resolved but from then on Dr. Thomas and the other departmental representatives reported to the environmental committee by phone, and carried on with their work in the field. The use of the Fisheries patrol boats had, however, been clarified upon Mr. MacDonald's return from Halifax. They were to be used by the Fisheries personnel and only by Imperial Oil in the case of an emergency.

At 8:00 p.m. that evening the management committee assembled. Mr. Hornsby presided and Messrs. Whynot, Clare, Hancock, Warner, Evans, Marsham, Boyce, Davidson and Lefevre attended. Preparations for the refloating of the stern section and support to Atlantic Salvage were discussed. Captain Davidson was asked to find a suitable cove and plot a route to it and also to plot a route for a tow to sea. He was assigned a helicopter for this purpose. Mr. Boyce was asked to make a study of the direction of flow of the oil slicks and prepare for the release of further oil at the time of refloating. A general discussion of the use of dispersants took place and Dr. Warner opposed the use of these chemicals. Directions were given to locate supplies of straw and the possible use of peat moss was mentioned. The use of sea beads for burning at sea had not yet been evaluated and experiments with different types of boom to enclose the burning oil were to be continued.

The weather forecast for the next 24 to 36 hours was for gales, and since Atlantic Salvage had not yet completed all the arrangements for the introduction of air into the wreck, the time table of events leading up to the commencement of the operation was falling under the eventual control of the elements. This fact did not, however, deter any of those involved from making every effort to complete their individual tasks with the greatest dispatch.

Later that evening, Captain Richard Alexander, the Assistant Chief of Staff for Operations and Logistics at the United States First Naval District, arrived from Boston. He was the planning officer for contingencies involving major oil spills in coastal waters and had been sent to observe first hand the problems ensuing from a major spill in a relatively remote area where major salvage and pollution control was not immediately available. He met with Mr. Hornsby and Captain Marsham and was given a quick briefing on what had transpired to date and of their plans for the next couple of days. Captain Alexander stated that both he and his assistant were impressed, that they had made an effective start in determining the problem that they were faced with and had developed some sound alternative courses of action. He thought the decision to refloat the stern section was a proper one and felt that the small group of persons assembled at Port Hawkesbury brought the limited resources available to them to bear on the execution of the plan.

CHAPTER 8

FEBRUARY 10, 1970 - TUESDAY

EQUIPMENT PLACED ON BOARD

At 1:30 a.m. Mr. Evans met for the last time with Mr. Costeletos. His calculations were reviewed and the owners' representative agreed that they were reasonable. Mr. Costeletos left by car at 4:00 a.m. for New York, feeling that he was no longer required at Port Hawkesbury. During the hearings Mr. Costeletos summed up his three day visit to Chedabucto Bay by saying that he was politely ignored. He also expressed the view that if he had been in sole charge of the operation he would have brought the full force of government to bear on the resolution of the problem so that a great deal of the pollution could have been prevented. The actions he did take while here, however, tended only to slow the entire effort and he made no reasonable suggestions of alternatives that could have been followed. He was not in fact ignored. He simply had no worthwhile suggestions to make. Although his company managed a great many tankers and some of these had been involved in previous oil spills, they had not developed any contingency plan to deal with these catastrophes. Mr. Costeletos simply had had no more experience in this sort of activity than the others present and since he admits that no research has been conducted by his company since the ARROW disaster, it is doubtful whether they would be in any better position today to deal with a similar crisis than they were in 1970.

The main activity on Tuesday was, of course, the assembly and transportation of equipment and supplies to the ARROW in preparation for the refloating of the stern section, its subsequent disposition and the control of the additional oil escaping during the operation. Mr. O'Connell was on the job by 5:00 a.m. assembling materials at the dock

to be taken to the ship by helicopter. He also arranged for a closing of a section of the Trans-Canada highway to be used as an airstrip in the event that mass air spraying of Corexit should be required.

By early that morning reports had indicated that oil was coming ashore at Cape Auget on Isle Madame and at Janvrin Island causeway in large quantities.

At 6:00 a.m. Mr. Partridge left for the ARROW on the LYNN KATHLEEN with his divers and boat crew. Mr. Kerr remained ashore to supervise the air lift of materials to the wreck. By this time Mr. O'Connell had brought together on the wharf a tremendous amount of equipment and it was intended to take that equipment out and install it during the day. The heavy lift helicopter arrived at 8:00 a.m. and Mr. Kerr accompanied it along with the compressors, oil drums and other equipment to the wreck and remained there the rest of the day.

A meeting of the management committee was called for 8:00 a.m. None of the Atlantic Salvage people attended this meeting but were represented by Mr. Whynot who acted as chairman that morning. He presented the schedule of activities relating to the refloating operation and priority for the large helicopter was given to Mr. Kerr.

The fate of the forward section was discussed at this meeting and some attempt was made to estimate the amount of oil remaining in her tanks. The possibility of destroying this part of the ship was discarded and it was decided that nothing would be done until after the refloating operation of the stern had been completed.

Dr. Lefevre was placed in charge of the experiments being conducted with sea beads. Mr. Boyce assumed responsibility for the establishment of a temporary meteorological station and proceeded to tie in various weather forecasts so as to have specific predictions for Chedabucto Bay.

The winds at that time were still fairly light but were carrying oil to the southern shores in the Canso area. During the morning the Canso Tickle became filled with heavy, thick, viscous oil. With the bad weather approaching back-up booms for the areas where commercial booms were being maintained became a necessity. Someone suggested at the meeting that telephone poles might be used and this possibility was checked out. The possible using of a gelling agent to contain the oil in the bow section was advanced once again by Mr. Hornsby and this idea was to be followed up.

By 11:00 a.m. Captain Davidson and Commander Hope of the Canadian Armed Forces had completed the survey of Chedabucto Bay for a possible beaching site which had been arranged the night before. They reported that there were no coves suitable and the only alternative now remaining was a tow to sea for flotation.

In London that morning Mr. Arthur Tripp, the managing director of the International Tanker-Owner's Pollution Federation, which manages TOVALOP, posted a letter to Mr. Stead acknowledging that the owners of the ARROW were members of the TOVALOP agreement. He advised the Canadian Government as well that the ARROW's responsibility for the cost of clean up under the agreement was insured and a copy of the agreement was included under which it could be calculated that there was roughly \$1,200,000 available to apply towards the cost. I will deal with this agreement in more detail later on.

Dr. Lefevre pursued his responsibility to make further tests of the glass beads. He chartered the SHEDIAC BAY and took the Pittsburgh representatives and two Fisheries Department men to a position near the wreck. Several successful burns of small oil pans were completed and they then headed for the beaches on the southern shore to try more burns there.

By 1:00 p.m. Mr. Dalziel had arrived at Port Hawkesbury. He met with Mr. Hornsby and was asked if he would take charge of the environmental section of the management committee. Although he had been sent to Port Hawkesbury to coordinate the activities of the Fisheries people there, he agreed to accept this post. From then on all the environmental people reported to the management committee through Mr. Dalziel. They would meet prior to the evening meetings so that he would have their accumulated knowledge of the day to present to the management committee meeting.

Tuesday afternoon was marked by several visits. Mr. Twaits, the president of Imperial Oil Limited, arrived in Halifax and was flown by DOT helicopter to Port Hawkesbury. He was accompanied by Mr. Weston and Mr. Belshaw. Before landing they overflew the Bay and observed the wreck and the heavy pollution on the Canso shore and Isle Madame. Upon arrival at 3:00 p.m. they met with Mr. Hornsby and subsequently Mr. Twaits and Mr. Belshaw left to meet with the Imperial Oil people and Mr. Hornsby briefed Mr. Weston on what they were planning to do. As soon as these gentlemen had come and gone, Premier Smith of Nova Scotia arrived for a personal inspection of the area and met with Mr. Hornsby. He later was given a full and comprehensive report on the activities being carried on by the management committee.

While the various visitors were attending at Port Hawkesbury, efforts to complete the work on board the wreck had continued. In order to land the heavy compressors on board a heavy wooden awning had to be removed and this took a fair amount of time but by five o'clock all of the equipment had been placed on board the ship except the ullage covers which were being completed at the shipyard. They were scheduled to be finished by early the following morning and would be taken to the wreck at the time. The weather con-

ditions were worsening and the ARROW was rising and falling with the action of the sea about twenty feet with each movement. Some of those who viewed her felt she had crept further down the Rock away from the bow section but others were of opinion that she was in the same position in which she was left after the break. Messrs. Kerr and Partridge came ashore on the last helicopter trip leaving their three divers on board. The two tugs holding the stern section on station were, of course, there with their lines attached.

When Mr. Kerr returned to Port Hawkesbury he had a further discussion with Mr. Tomkins. The evening before he and Mr. Evans had spent several hours making Mr. Tomkins familiar with the wreck and Canadian law. He showed Mr. Kerr a letter which he had prepared addressed to Mr. Hornsby in which he stated that since the Canadian Government had taken over he was instructing Atlantic Salvage Limited to cease work as of midnight Tuesday, February 10. Although he told Mr. Kerr privately that Atlantic Salvage was not to permit the situation to deteriorate by withdrawing, he indicated that he was going to deliver this letter to Mr. Hornsby. Mr. Tomkins was obviously protecting the legal interests of his clients, the owners and insurers of the ship, in making this move. But he was also throwing the element of uncertainty into a crisis situation which required the utmost cooperation of all participants. His action cast an unnecessary strain on those who had been working steadily for many days and nights to overcome a major catastrophe. Actions of this type point out very clearly the need to isolate the person in charge of this type of operation from these secondary problems generated by the desire to limit or avoid responsibility on the part of those engaged in the business of transportation of goods by sea.

The regular evening management committee meeting was delayed by the Premier's visit and didn't get under way until nearly 10:00 p.m. Mr. Hornsby presided and all of the regular members were there. Mr. Dalziel attended for the first time. Reports indicated that compressors had been installed on board the ship and all equipment supplied. Everything was in readiness to commence pumping as soon as the ullage ports were completed and installed. The weather was deteriorating rapidly and it would obviously be necessary to await the passing of the storm before operations commenced.

Mr. Dalziel agreed with the plan to float the ship and considered the trade-off of 5 to 7 hundred tons of oil a reasonable one if it would enable the balance of the cargo to be removed. His environmental group were concentrating on the containment of any oil released and its absorption or burning if possible. He expressed the opinion that dispersants should be used as little as possible.

As the meeting progressed reports came in from the Captain of the VALIANT to the effect that difficulty was being experienced in holding the ARROW in position. Mr. Evans discussed the problem with the captain at some length and subsequently Mr. Kerr engaged an additional tug, the IRVING BEACH, to assist.

As the meeting continued the usual matters were reviewed. A report on the sea beads indicated that it was not yet feasible to release a large quantity of oil with the expectation of burning it at sea. Mr. Boyce reported on the use of straw mulchers and the conditions of the booms at the fish plant. Mr. Kilpert advised the meeting that the gelling agent was not available.

Captain Davidson had completed plotting a course for towing to sea and since this appeared to be the only remaining option open, Mr. Dalziel was asked to arrange

for his group to prepare for the release of oil on this route. Captain Davidson was then asked to check for possible coves along the route in the event that the tow experienced difficulty and required beaching.

While the management committee met, Captain Marsham was attempting to establish a communication system between the various tugs that would be involved in the re-floating operation. This was eventually achieved.

The Atlantic Salvage divers had been kept on board until almost midnight but the intensity of the storm was increasing to the point where the LYNN KATELEEN along side was taking a bad beating and Mr. Kerr gave permission for the men to come ashore.

CHAPTER 9

FEBRUARY 11, 1970 - WEDNESDAY

RIDING OUT THE STORM

The management committee meeting didn't break up until after 1:00 a.m. Mr. Dalziel drove Mr. Hornsby to his motel where they held a discussion in his room concerning the relationship between his department and the DOT. As he entered his room Mr. Hornsby received a letter from Mr. Tomkins stating that the owners of the ARROW no longer assumed any legal responsibility for the ship since the Government had taken over. He also found a request from Mr. Kerr for a meeting no matter how late it was when he returned since he knew the contents of the letter. So at 2:30 he called at Mr. Kerr's room in the same motel.

At this meeting, according to Mr. Hornsby, the knocking off of the Atlantic Salvage team by the owners was discussed. Mr. Kerr needed a contract and knew that Mr. Hornsby would not have authority to sign one without approval from Ottawa. He drew up a draft document, however, which was agreed to in principle, subject to authorization by the Department. Mr. Hornsby agreed to relay it to Mr. Weston in the morning and to recommend its acceptance to his superiors, because without Atlantic Salvage's services they would be unable to complete the floating operation.

According to Mr. Kerr's recollection he had gone to see Mr. Hornsby on Tuesday evening and discussed Mr. Tomkins' letter with him before it had been received. He had advised Mr. Hornsby that the owners were directing him to discontinue services at midnight and wanted to assure him that they would carry on. He explained that their costs were running at the rate of ten thousand dollars per day and he would like to have a contract from the government to cover him, but in no event would they let the operation fail.

at this late stage. He says that he agreed to draft a simple agreement and discuss it with Mr. Hornsby later in the evening. Mr. Kerr recalls that it was at this time that a taxi driver delivered the Tomkins' letter to Mr. Hornsby.

Whether Mr. Hornsby's or Mr. Kerr's recollection is accurate makes very little difference. It was apparently agreed that Atlantic Salvage would carry on and some effort would be made to have their services covered by a contract. The lack of sleep and the blending of one day into the next was making it very difficult for those concerned to keep accurate mental records of the chronology of events.

After this sudden turn of events Mr. Hornsby was unable to sleep. He spent the rest of the night considering the implications of the position taken by the owners, and of the need to maintain the salvage operation. Mr. Tomkins' letter is as follows:

J. Hornsby, Esq.
The Viking Motel
Port Hastings
Nova Scotia.

10th February 1970

Dear Sir,

s.t. ARROW

I refer to our telephone conversation of this afternoon from which I understood that the Canadian Government's position is that it has taken over the wreck of the above vessel in which they contend that the Owners no longer have any interest. I shall be obliged if you will confirm that this is in fact the Government's position in order that Owners may be advised regarding their further actions.

As you are aware the technical advice which my Clients, the Owners, have received is that the stern portion of the vessel should be towed to sea and sunk a suitable distance from the shore. I am now informed that this operation could be started tomorrow. However, I am unable to advise the Owners to put the operation into effect in the light of what I understand to be the Government's attitude as set out above.

In these circumstances I shall be glad to receive

your written reply to this question raised in the first paragraph of this letter.

Yours faithfully

M. O. Tomkins
p.p. Ince & Co
Solicitors acting on behalf
of the Owners of the s.t.
ARROW.

By 5:00 a.m. Mr. O'Connell was at his post once again and the straw was beginning to arrive for the beaches. He arranged for the installation of a spreader on one of the LCM's so that the sea beads could spread on oil near the wreck in a further test.

At 5:30 Mr. Hornsby drove to Port Hawkesbury Motel to be ready for any emergency that might develop at the command post. The weather was very bad and the winds extremely high. At 7:30 he was able to contact Mr. Weston about Mr. Tomkins' letter and he agreed to take the matter up with Mr. Stead. In the meantime Mr. Kerr was to be asked to carry on and he did.

Captain Marsham flew out over the wreck by helicopter with Premier Smith. He was surprised to note that the ARROW had moved about three cables and that the stern section was now about 1800 feet from the bow. When he dropped the Premier off in Arichat, he called headquarters and reported. As Mr. Hornsby received this report Messrs. Kerr, Evans, and Partridge came in and he asked them to fly out and assess the situation, which they did. After they left, Mr. Hornsby was afraid that if the stern section had in fact moved this far it might reach deep water and be blown ashore. The gale had now reached its full force with winds from the southeast and the wreck was becoming very difficult to manage. It was because of this deteriorating situation that he felt it necessary to remain at the command post, and

asked the Atlantic Salvage personnel to check what was happening to the ARROW. He had to be on station to give whatever orders were necessary when the report was communicated to him.

Mr. Hornsby stepped outside to visit the communications room next door and enroute slipped on a patch of ice and fell. He suffered a severe gash in his left hand which bled profusely. Mr. Clare suggested that the cut should be attended by a doctor and attempted to arrange for one to come to the command post as Mr. Hornsby did not wish to leave at this time. No doctor was available, however, so it was some time later in the day before the wound was sutured.

Captain Marsham returned to headquarters and was in the process of giving a full explanation of what he had seen to Mr. Hornsby when a call came in on RT from the captain of the IRVING MAPLE. The captain advised that the ship was afloat and asked where to take it. To him it seemed to be drifting towards the north shore and the tugs were attempting to pull in the opposite direction. An immediate decision was required by the Master who didn't want Captain Marsham to leave the phone and so the order was given to continue to tow seaward.

As soon as Mr. Kerr returned from the wreck and heard of this order having been given some heated words were exchanged. They immediately contacted the Master of the tug who said that he thought it was floating but it was not. The order was then rescinded.

The forward end of the wreck was resting on the bottom with a weight of 600 tons. Allowing for a coefficient of friction between the ship and the bottom of .3 this meant that he would need something like 200 tons to move it but the two tugs only had a combined bollard pull of 50 tons. It would have been impossible for the tugs to move the wreck under these conditions. What movement did take place

was a creeping one. The action of the sea caused the stern section to "walk" inch by inch as it was pivoted on the bottom, but it could not be said that at any time it was afloat.

With this crisis passed the long wait for improvement in the weather continued. The other activities not connected with the refloating operation carried on. Mr. Dalziel on the trip in from Arichat where he was staying inspected several of the beaches and sections of the shore and found them heavily polluted with oil. Dr. Warner's reconnaissance report was received at headquarters by Mr. Clare indicating further leakage from the forward section of the ship. New slicks were plotted and more pollution found on Janvrin Island.

About 10:30 Captain Davidson, Mr. Whynot and Mr. Strang flew over the wreck to check conditions. They reported that she had moved about a thousand feet from her position on the previous days and that she was on a steeper angle with the water only 25 feet away from the watertight doors. The whole of the propellor aperture could be seen as the stern rose and fell about 25 feet with each movement of the sea. Oil was visible in the water as well as a lot of mud which was being stirred up by the shifting action of the ship.

Mr. Evans also overflew the wreck that morning and although he couldn't land because of the weather he contacted the tug captains and discussed their efforts to hold station. Although the stern section had moved along the predicted path it was not heading for deep water and the tugs were able to keep matters under control. It was agreed that they should continue with their present pulls rather than make any attempt to walk the ship back in the direction from which it had come.

When Mr. Weston heard from Mr. Hornsby that

morning he got the impression that he was even more tired than he had appeared the day before. Realizing that he needed some assistance and a chance to get more rest, he arranged for Captain Mills of the Steamship Inspection Department in Ottawa to leave for Port Hawkesbury. He called Captain Marsham, who confirmed his assessment of Mr. Hornsby's condition and then decided to go to Port Hawkesbury himself to render whatever assistance he could under the circumstances.

Colonel Houser was finding that the military involvement at Chedabucto Bay was becoming greater than expected. So many requests were coming through from so many sources that he decided to send Lt. Cdr. Hollywood to the scene to act as the one person through whom all information would be channeled. It was also becoming necessary to insure that the vast amount of military equipment in the form of trucks, helicopters, explosives, etc., being sent to Port Hawkesbury, was kept under military control.

More and more people were arriving each day to assist Imperial Oil and the Government forces already there. The task of coordinating their efforts was becoming a major one and Mr. Clare's abilities were being used to the full extent. There still was some uncertainty in the minds of the Imperial Oil personnel, however, as to the specific role they were to play. Accordingly, Mr. Whynot contacted Mr. Twaits to see if he could obtain from Ottawa some sort of documentation outlining their responsibility and authorities under the Act. Major decisions were pending the refloating and they wanted to be in a position to either make these decisions or know the person responsible for making them, when the moment arrived.

During the morning Mr. Strang contacted Mr. Weston and asked that he arrange to have a coast guard ship available to accompany the tow.

Mr. Dalziel spent the day contacting all the scientific people at the scene and getting them organized into a group so that the main problems could be attacked. Dr. Warner had been doing a lot of reconnaissance and acting as biology advisor. Dr. Lefevre was concerned with the burning of the pollutant. Mr. O'Brien and Dr. Kilpert were working on dispersants. Farrell Boyce, the oceanographer, was pursuing several tasks. George Watson had arrived from the Canada Wildlife Service and he was expecting Mr. Pierce and Mr. Wood of the same service from Fredericton. Mr. Glen Sharpe from the Nova Scotia Department of Fisheries was on sight concerned with the effects of oil on the Irish moss industry. Not only was the oil coming ashore but it was very often bringing with it seaweed ripped by its weight and the action of the sea from the bottom. Mr. Fred Barber from Energy Mines and Resources, was coming along with the Research Ship DAWSON with Dr. Forrester in charge.

Apart from the testing of burning agents, chemical dispersants and mulches, extensive surveys were conducted on the effects of the spill on wildlife. The Inspection Service checked quality control at the fish plants. The moving of oil slicks had to be monitored and checks made for the fouling of fishing gear. Later that afternoon, Dr. Lefevre conducted a test of burning Bunker "C" oil at Arichat using the barrel boom constructed at the shipyard. The test ended in disappointment as the heat caused the barrels to rupture and the boom was found to be unsatisfactory.

The first formal meeting of the environmental committee group under Mr. Dalziel was convened at 6:30. The representatives attending were from Imperial Oil Limited, New Jersey Chemicals, Bedford Institute of Oceanography, Marine Ecology Laboratory, Memorial University, Energy Mines and Resources of Burlington, Pittsburgh Corning Company, Nova

Scotia Department of Fisheries, Canadian Wildlife Service, Nova Scotia Emergency Measures Organization, United States Army, Canadian Armed Forces, Department of Transport, National Park Service and various branches of the Department of Fisheries and Forestry of Canada. Reports were received from each of the day's activities and arrangements made to coordinate the use of land, sea and air transportation. Mr. Dalziel then attended the management committee meeting which followed.

Before the management committee meeting got under way that night Mr. Whynot was talking with Mr. Barrett at the head office of Imperial Oil. An appointment had been made for Mr. Barrett to meet with the Associate Deputy Minister, Mr. Stead, and Mr. Whynot urged that the need to bolster DOT management at Port Hawkesbury should be impressed upon him. He felt that someone should be sent to deal with the business and legal matters which were interfering with the operation.

About the same time Mr. Hornsby was in telephone communication with Mr. MacGillivray, the director of Marine Regulations for the Department of Transport at Ottawa, who was working very closely with Mr. Stead on the ARROW problem. They discussed the need for the appointment of Atlantic Salvage Limited by the government to carry on with the refloating operation, and then Mr. Kerr took the phone and spoke directly with Mr. MacGillivray. Mr. MacGillivray was concerned about the Tomkins letter and he asked whether Atlantic Salvage would continue or whether it was going to back out. Mr. Kerr, who was also at this time showing the effects of lack of sleep, expressed himself poorly when he told Mr. MacGillivray that they would continue but they would not work for Imperial Oil. This reply indicated to Mr. MacGillivray that there was friction between the two

outfits when in fact they had been working together very amicably. All Mr. Kerr really intended was to say that they would continue to work but did not wish to take directions in salvage matters from Imperial Oil Limited who were acting as agents for the Crown. They felt there had been some interference with the shipboard end of things and that they could not take such interference from people who were not experts in the field. The misunderstanding was unfortunate but Atlantic Salvage did agree to carry on.

The regular management committee meeting took place that evening beginning about nine. Mr. Whynot chaired the meeting at Mr. Hornsby's request. Although Mr. Clare had arranged for medical attention for Mr. Hornsby's injured hand a little earlier, he still was very tired but remained at the meeting until 10:30 p.m.

No new decisions were taken as the plans were being delayed by weather. Men and equipment were to be taken to the ARROW the following morning at 8:30.

The usual reports were received concerning the oil reconnaissance and it was revealed that the boom at Petit de Grat had broken. The rupturing of the drums during the burning experiment was reported and further that experimentation had established that burning with sea beads would be extinguished if the winds were over ten knots. The Atlantic Salvage people reported everything in readiness for the morning.

Mr. Hornsby returned to his motel room and was able to get six hours sleep before attacking the problems of the next day. About midnight, Mr. Kerr contacted Mr. Weston by phone and suggested as a friend that Mr. Hornsby should either be relieved or given some assistance, because of his exhausted condition. Mr. Strang was present during

this call and took the phone to confirm Mr. Kerr's opinion. He suggested, however, that a good night's sleep was all that he really required.

CHAPTER 10

FEBRUARY 12, 1970 - THURSDAY

THE ARROW SINKS

The storm had passed and the weather was improving as activities commenced early Thursday morning. During the night a special type of blower had been flown in by jet for spreading sea beads on the water and Dr. Lefevre wished to test it before the release of any further oil. Captain Marsham authorized the environmental protection group to proceed to the ARROW on the SKUA to conduct experiments in the area.

Dr. Thomas started his detailed study of a lagoon on Janvrin Island. He chose a spot that was a fertile area for soft shell fish such as clams and eel grass. Eighteen inches of thick oil had been caught there. Some of the clams were dead and others were dying from suffocation, and all sunlight was cut off from the plant life.

Captain Marsham took an early flight over the wreck and reported that it seemed to be further down the Rock. A port list had developed, but it was in the approximate area to which it had moved the day before.

Mr. O'Connell received mulchers from the Department of Highways that morning. The intention was to mulch the straw and place it on the new oil being released, in the hope that the mixture could then be directed into a beach area and more easily handled. They found, however, that the straw would not absorb the emulsified oil.

By 9:30 Dr. Lefevre and the Pittsburgh Corning people boarded the SKUA with their equipment and prepared to leave for the ARROW.

The buoyancy plan was to proceed. If it should succeed the stern section was to be towed out to sea. Mr.

Hornsby arrived at command headquarters and found that flying conditions were better. The planned survey of the condition of the ARROW by Messrs. Kerr, Partridge, and Evans as part of the schedule for the floating operation began. As they were about to leave, a report was called in from the captain of the VALIANT to the effect that the ARROW was in trouble, and Mr. Evans spoke to him. He arranged a series of hand signals which would be used to pass information from the helicopter to the tug when they arrived, since there was no other means of communication. The three boarded the helicopter and flew out to the wreck, and it was apparent to Mr. Evans on arrival that the ARROW was in a sinking condition. Her tip had increased to 45 degrees and the seas were pounding her up beyond the watertight doors. Water was getting in the vents. As Mr. Kerr said, you could see her going down. They called the report in to Mr. Hornsby, who also heard from Dr. Lefevre on the SKUA to the same effect.

Mr. Weston, on his way to Port Hawkesbury that morning, overflew the wreck. He also noticed that she seemed to be lower in the water than on Tuesday when he saw her last. Within fifteen to thirty minutes of the time he arrived at headquarters the reports were coming in that she had sunk. By the time Messrs. Kerr, Partridge and Evans arrived back the ARROW was resting on the bottom with only a few feet of her funnel showing above the surface.

You can imagine the disappointment among all of the people who had played such a leading role in the attempt to complete the salvage operation. As Mr. Whynot said, "We all cried a little". There was, of course, nothing that they could do. From now on it was a new ball game.

Mr. Hornsby, although terribly disappointed, was relieved somewhat because the wreck had landed on a flat sandy bottom and was not in deep water, and, now that the urgency of the situation had been removed, he turned his

attention to the major problem of the clean up.

Mr. Weston advised Mr. Stead that the ARROW had sunk and was resting in an upright position on the bottom and then turned his attention to the new problems at Port Hawkesbury. He still considered Mr. Hornsby very tired and in need of medical attention. An inspection of his hand revealed that the wound was becoming infected and he arranged for him to see a doctor in Port Hawkesbury. Captain Mills was on his way and Mr. Weston decided to remain on site himself.

After the ARROW sank there was much speculation as to the cause of its sinking. Some thought that the stern section had been pulled into deeper water by the tugs the day before, and that leakage through the watertight doors into the engine room brought about her end. Mr. Evans, however, was of the opinion that she sank as a result of a small rupture in her hull plates caused by the continuous action of the sea during the storm which preceded her sinking. I accept his opinion on this point.

When the ARROW sank to her final resting place there was a large escape of oil. It headed for Janvrin Island and by the time Dr. Lefevre reached the scene on the SKUA it was too far inland to be followed. They could not therefore attempt the burning in open water with the sea beads as they had planned. Dr. Warner's reconnaissance report indicated that the southeast shore of Isle Madame was heavily polluted and other reports of pollution kept pouring in.

After the initial let down by the sinking of the ship at mid-morning, there was need for a completely new approach to the problem. Messrs. Hornsby, Clare, Whynot and Captain Davidson made a tour of the shore area by helicopter. Every inlet and indentation seemed to be collecting thick masses of oil. The survey took most of the afternoon and once

again impressed upon everyone the magnitude of the problem they were facing. Upon return, Mr. Clare called the offices of Esso International New York and explained that they had completely run out of ideas. He asked them to search for some one who might have some way of attacking the problem and they came up with the name of Captain Svend Madsen, the Chief Salvage Master of the company. Arrangements were made to dispatch Captain Madsen at once.

During the afternoon Captain Vlismas, Captain Anastassopoulos, the Chief Engineer of the ARROW and the remainder of the crew left Port Hawkesbury for good.

In the early evening Messrs. Whynot and Davidson drove to Halifax to meet Captain Madsen and bring him back to Chedabucto Bay.

A regular management committee meeting was assembled at eight and since Mr. Weston was the senior DOT person there, he presided. The situation was assessed and a good discussion took place concerning the sinking of the stern section. Its position was determined and Imperial Oil representatives advised that they had arranged for a salvage expert to come from New York the next day. The environmental section reported on the escape of oil from the wreck and how it had moved in a direction not predicted in advance, making burning impossible. It had been planned to lasso the slick and then burn it with beads in such a manner as not to interfere with the towing of the stern section to sea.

Plans for reconnaissance and burning of inter-tidal pools the next day were made and further efforts to mulch and burn the oil on the beaches would proceed. The meeting was advised that the Minister of Transport, Mr. Jamieson, would make a personal visit to Port Hawkesbury and plans were made for his complete briefing. The meeting was not a long one and those attending looked forward to a good

night's rest when it was completed.

Captain Madsen arrived in Halifax at ten
that night.

CHAPTER 11

FEBRUARY 13, 1970 - FRIDAY

A NEW BALLGAME

Arrangements were made for Mr. Hornsby to be relieved by Captain Mills, arriving from Ottawa this morning with the Minister's party. His hand was still infected and Mr. Weston felt that he should go to Halifax for treatment and rest.

The morning reconnaissance was conducted and very little oil was leaking from the wreck according to reports made to Mr. Clare. The major portion of the northern shore, however, was completely polluted. This covered an area of more than 25 miles.

Mr. Weston had breakfast with Mr. Tomkins. He still had legal problems he wished to discuss and once again was referred to the proper people in Ottawa. Mr. Weston, of course, had no more authority than Mr. Hornsby previously to make any legal commitments.

Mr. Kerr had a discussion with Mr. Webster of CIL that morning concerning the possibility of blowing the hatch coamings off the submerged wreck should an off-shore wind develop.

Dr. Lefevre and Dr. Warner patrolled the Bay by helicopter to locate the most suitable areas for burning the oil by landing craft that could be put ashore from the SKUA.

At 10:00 a.m. Mr. Weston went to Sydney to meet the Minister and Mr. Stead. They overflew the area but had only covered Arichat, Janvrin Island and the wreck when squalls forced them to land.

Meanwhile, Mr. Whynot was driving Captain

Madsen to Port Hawkesbury from Halifax. The Minister had already arrived when they reached their destination and was having a discussion with Mr. Hornsby on the situation as it stood prior to a scheduled meeting with the press. Captain Madsen met Mr. Kerr and Mr. Evans and had a thorough discussion of the various possibilities and different techniques for removing the oil, and the best method of mooring the wreck.

The minister departed after having made a thorough inspection of the area and having been briefed on the situation as it then stood. Mr. Stead remained behind for the rest of the day. He had discussions with Mr. Weston and the need for some formalized arrangements with the Armed Services was pointed out. He also had discussions with Mr. Whynot who drove to Sydney and then flew with him to Ottawa that night.

According to Mr. Stead it was during this visit to Chedabucto Bay that the idea of a task force to deal with the calamity arose.

With no real power and no access to funds, what the Department could do was limited. Imperial Oil was doing its best and the government was putting what resources it could muster directly into the operation. But it was becoming evident that this was not enough and that an organized team had to go in. The Government and the Minister were being criticized although they really had no authority to do anything. The situation that developed was one which required a step to be taken by Government without prior parliamentary authorization. There was some chance of recovery under the TOVALOP scheme but this was uncertain, and so the Minister would have to take the risk of making substantial expenditures on public account without legislative backing. There was a need to commit highly skilled and ex-

pert persons and substantial resources to tackle the mass clean up of Chedabucto Bay. This consensus was reached by the Minister and senior government officials when they had seen for themselves the magnitude of the problem proposed by the extensive pollution of Chedabucto Bay.

Before Mr. Whynot left that evening, he arranged with Mr. Kerr to keep his diving team on site so they could assist Captain Madsen in making a survey of the wreck the following day. Mr. Kerr also met with Mr. Weston and agreed that after a weekend rest they would meet and make plans to carry on.

The management meeting that evening was attended by Messrs. Weston, Clare, Hornsby, Dalziel, Hancock, O'Connell, Lt. Cdr. Hollywood and Captain Madsen.

Captain Madsen explained to the meeting his proposal for removing oil from the submerged wreck. He drew a diagram on a blackboard showing how a valve could be attached to the deck plate of a tank with a cutting tool inside. The deck plate could then be cut and the bit withdrawn so that the valve could be shut off. The bit could then be removed and a hose connected leading to a surface vessel that would be used to receive the oil. The plan required steam to be introduced into the hose to maintain the temperature of the oil while it passed through the cold waters but the actual flow of the oil which was still at a temperature permitting it to flow would be caused by the difference in the pressure at the top of the ship's tank and that at the bottom where salt water would be let in.

Captain Madsen wished to make a survey of the ship the following morning with the Atlantic Salvage divers to assess its position and then go to Imperial Oil Refinery at Dartmouth to have the type of valves he required made up and tested by divers in the waters of Halifax Harbour.

This process became known as a 'hot tap' method because of its similarity to the procedure of tapping a live line of electricity or flowing line of liquid. The word 'hot' in the expression has nothing to do with temperature but is merely the tapping into a pipe that is full rather than a pipe that is empty.

After Captain Madsen's report, the meeting discussed the disposal of oil recovered and it was agreed that an approach would be made to the Provincial Department of Lands and Forests to locate burial sites for mixtures of sand and oil that might be taken physically from the shores or the water or the wreck.

The spreading of Corexit on certain beaches and then observing what the wave action would do after a day or so, was also considered. By this time, however, Dr. Warner arrived from his reconnaissance flight and a large chart was marked with the various locations of oil that he had observed. Different markings indicated light or heavy pollution and any change from the previous day was noted. Nothing further of significance occurred that night.

CHAPTER 12

FEBRUARY 14 TO FEBRUARY 20, 1970

THE DOLDRUMS

The sense of urgency had now passed and Saturday morning found the various forces at Port Hawkesbury catching their second wind. Mr. Clare left early in the morning to spend the next few days in Toronto and Mr. O'Connell once again took charge of the Imperial Oil personnel at the site. Mr. Weston acted as the on-scene commander.

Further burning experiments with the use of beads were conducted on shore and on the water. They were not successful as it was impossible to sustain ignition in the emulsion of oil and salt water. An attempt to pump the oil from the surface was made by using herring seiner pumps and this was found to be impractical. Straw was tried once again but would not mix with the emulsion.

Captain Madsen went to the site of the wreck with the three divers left by Atlantic Salvage. They lifted the ullage ports and confirmed that there was still between 40 and 50 thousand barrels of oil remaining in the stern section of the ship. Soundings were taken from a fishing boat suggesting that the ship, although resting on a flat bottom, was near the edge of a 40 to 50 foot trench. Such a configuration raised the possibility that the wreck might topple over and be lost in the deeper water, and to avoid this possibility, Captain Madsen decided that the recovery of oil from the stern section of the ship must be started first. The divers were only able to go to a depth of 50 feet and therefore were not able to confirm the presence of a trench, but they were able to confirm the possibility of Captain Madsen's plan to tap into the submerged tanks. With this information, the salvage master decided to advance his

plan. He contacted Mr. Grassby, the superintendent of the Imperial Oil Refinery at Dartmouth, and found that the refinery had previously used a 'hot tap' for tapping lines under pressure. Encouraged by this information, Captain Madsen arranged to visit the refinery and assist in the make up of valves for use in a 'hot tap' attempt to off-load the cargo of the submerged tanker ARROW. Mr. Weston made arrangements for Captain Madsen to fly to the refinery the following morning by helicopter.

On Sunday morning Mr. O'Connell received permission to make a further limited test with Corexit. He arranged for a 40-foot Cape Island type boat to spray the dispersant on the water and then agitate it. While this test was taking place bulldozers were being lined up to start mechanical cleaning of the beaches by removing the soil, sand and rocks and trucking it away to dump sites. These dump sites had been picked by the Department of Lands and Forests of the Province in areas of heavy clay soil. The plan was to bury the oil at these sites where it would not be able to penetrate the ground. The sites would, in effect, act as storage tanks for the mixture dumped in them.

During the day, Dr. Thomas witnessed a further attempt to burn oil located in a deep pool on the east of Janvrin Island causeway by using glass beads. Heat was generated to the point where rocks were exploding and occasionally short bursts of flame were produced, but, as soon as the oil reached the point where internal waves permitted burning, the flames invariably went out.

Dr. Thomas produced a series of coloured photographs which he took on Friday and Saturday showing the attempts to burn the oil and the general condition of the shores at the time. He described the oil to the east of Janvrin Island causeway as follows: "the oil here was 7 inches

in depth -- it is quite hazardous walking through it because you get stuck in it and the photographs show this oil on the beach with footsteps going through out." Another picture shows a floating pan of oil an inch thick coming towards the shore with a leading edge of emulsified oil particles making the water in front of it brownish in colour. The jet black oil slick and the brownish water were both engulfing a bit of seaweed, which would stick to the oil on the surface and be pulled from the bottom as the heavy slick ran ashore. The seaweed would also be torn from the shore as the tide rose and the Bunker "C" oily mass was raised with it. Such a mixture of seaweed and oil was clearly shown by photographs as well.

During this time of year the shores normally were caked with ice deposited with the rise and fall of the tide. In many lagoons the ice extended out over the surface of the salt water. Photographs were presented to show the oil mixed with the ice forming a floating brownish, blackish mass of mixed oil and ice along the coast.

Many pictures were produced revealing the black mass of thick oil polluting the shores of Isle Madame and other shores in the area. The rocks were covered and the crevices filled with varying depths of oil. At the shoreline the brownish mixture of ice and oil could be seen with heavy pans of jet black goo on the surface beyond. Where the wind had combined with the breaking action of the sea along the beaches a mixture of the consistency of brown sugar was created.

Bunker "C" fuel oil has been described as what is left over after the lighter fractions of the petroleum have been removed. This is an indication of how heavy a product it is. Once deposited in the near freezing temperatures of Chedabucto Bay, it became almost a solid and you really have to see it to appreciate what a sticky grimy mass it became.

Unfortunately it was not cold enough, however, and it continued to flow freely. It stuck to everything it touched like a coat of wet paint an eighth of an inch thick. The shores once lined with rocks kept antiseptically clean by the action of the sea were now lined with black rocks destined to release a bit of their cover each time the temperature rose during the years ahead. Blotches of oil carried by the winds contaminated whatever they hit before coming to rest far behind the high water mark of the shore. Wharves and jetties were blackened with pitch and the hulls and decks of all types of craft using the waters were fouled in the same manner.

Dr. Thomas and his associates started to work extensively on their investigation of the shore and shallow water areas called lagoons. These lagoons are ponds protected from the sea by barrier beaches. They are typically very productive. They are shallow and have a lot of soft shell clams in them and high production of eel grass as well.

The Janvrin lagoon was seven acres in extent. It almost dried out at low tide having a narrow mouth but was acting as a collection reservoir for oil coming ashore at the time. The oil could get in at high tide but didn't seem to be able to get out at low, so it started to pool very deeply in this and other lagoonal areas. Dr. Thomas recorded about 18 inches accumulation in Janvrin Island lagoon lying over extensive beds of soft shelled clams, which, of course, are edible shell fish. An inspection made under very cold and difficult conditions showed that some of the clams were dead and others were dying, and this was attributed to suffocation caused by the oil lying over the surface.

Observations were then conducted along the intertidal zone between high and low water marks. The damage indicated there was also mainly mechanical, that is, it was putting a black film over the entire intertidal area and was suffocating any animals underneath and also cutting off sun-

light from any plant life, thus preventing photosynthesis in the normal way. On sandy shores the effects biologically were not too significant because of the small amount of life supported by exposed shores of this type in northern areas. It was not possible to check at this stage for damage to microscopic life.

The sublittoral zone immediately below extreme low water mark could not be examined from shore and arrangements were made to have this area checked by skin divers. Although watches were being kept for evidence of damage to marine life in the Bay, no finds of fish kills had been discovered up to this time.

The weather on Sunday afternoon was quite bad and it was doubtful whether Captain Madsen's return to the Dartmouth refinery could be made, but eventually a helicopter flight was permitted. Mr. Weston remained at the scene and during the afternoon had a visit from the Nova Scotia Minister of Lands and Forests and his Deputy. After a review of the situation, they suggested that blueberry burning equipment might be of some assistance in burning off some of the oil and made arrangements to have some delivered the following day.

On Monday, February 16, Mr. O'Connell returned to Halifax for two days, leaving Port Hawkesbury for the first time since his arrival on the morning of the 5th. Mr. Hornsby had had a good weekend's rest and reported to his office in Halifax that morning as well. Mr. Strang was brought back from Sydney as Captain Mills had returned to Ottawa and Mr. Weston was planning to leave for Halifax that afternoon. He was asked to act as Mr. Weston's representative at the site for a few days and was briefed on the Madsen plan and the attempts being made by Imperial Oil at cleaning the beaches with the bulldozers and truck. Mr.

Strang was also to be responsible for the use of ships and helicopters and the supervision of activities at Chedabucto Bay until new plans were formulated.

At Toronto, Mr. Clare reported to the executives of his company and made arrangements for the Dartmouth refinery to assist Captain Madsen in the mock up of his proposed technique. Captain Madsen supervised the preparations being made at the refinery machine shop and then arranged with Lt. Cdr. Sagar in charge of the naval diving school to test the equipment in Halifax Harbour.

On Tuesday morning Mr. Hornsby left for Ottawa where he made a complete report to Mr. MacGillivray on the activities which had taken place at Chedabucto Bay.

At Halifax that morning Mr. Weston had arranged a meeting at Maritime Command Headquarters between the Commander of the naval diving unit and Captain Madsen. It was agreed that naval divers would be used to assist in the removal of the oil from the wreck of the ARROW and they were taken to the refinery and given instructions on the 'hot tap' method to be used. For the next few days these divers were trained in the procedures necessary to carry out Captain Madsen's plan.

By Wednesday February 18th, Mr. Clare and those at the head office of Imperial Oil Limited had received word that the Canadian Government was proceeding with the appointment of a Task Force to attack the problems of Chedabucto Bay. Word was then passed to Captain Madsen that his services would be no longer required and arrangements were made for his return to New York. Mr. Clare flew back to Port Hawkesbury to take charge of Imperial Oil operations there. Mr. O'Connell returned the same day.

The mechanical beach cleaning operation was continued and further tests made with Corexit at Janvrin

Island. Although the results were encouraging from these tests they found it was taking one gallon of Corexit to disperse one gallon of Bunker "C" and at this ratio, of course, the operation was much too expensive. They planned to try to improve the ratio in the days that followed.

On Thursday, February 19, Mr. Weston returned to Port Hawkesbury and Barry Strang was relieved and was able to resume his regular duties at Sydney. Activities around Chedabucto Bay were slowing down and after further unsuccessful experiments with burning of the oil, all further attempts to use these methods were halted by Mr. Weston.

On Friday, February 20, Mr. Clare and Mr. Weston were touring the beaches near Petit de Grat in the afternoon to assess the mechanical clean up operation. Because of the extensive build up of ice the use of bulldozers and truck to cart away the polluted surface did not appear too successful.

While they were there they examined the booms at the fish plants and they appeared to be quite effective.

Mr. Weston called Mr. Stead from Petit de Grat and was advised that a Task Force had been appointed to assume full responsibility for the clean up of pollution at Chedabucto Bay. Mr. Clare and Mr. Weston were asked to attend a meeting with the Task Force at Maritime Command Headquarters in Halifax the following day.