

CHAPTER 13

REFLECTIONS ON THE EFFORTS TO FEBRUARY 20, 1970

The appointment of a Task Force was to mark the beginning of a new approach to the problems encountered at Chedabucto Bay caused by the grounding of the ARROW on February 4th and the subsequent escape of her cargo of Bunker "C" oil and pollution of the shores of the Bay. A valiant effort in cooperation launched by representatives of the owners of the ship, its insurers, and the owners of the cargo with the assistance of the Department of Transport had been thwarted by the actions of the wind and the sea. The original attempt to off-load the cargo from the wreck and after the breaking of the ship to refloat the stern section and tow it to sea had met with failure. Tons of oil had already escaped from the ruptured forward part of the ship while the after section of the ARROW rested on the bottom with 9 of her original 27 cargo tanks still full.

The thick, viscous oil that had already reached the shores of Chedabucto Bay was snuffing out life in both animals and plants in the intertidal zone. It was adhering to rocks, molluscs and barnacles and to the algae growing on the sea bed. This algae was being ripped from the bottom and stranded on shore. The black viscous liquid was polluting everything it touched. By the day the stern section sank, 36 statute miles of the North Shore of Chedabucto Bay and 56 statute miles of the South and Southeast Shore were heavily polluted. An undetermined but large additional mileage of the shore line received light fouling. By the time further oil had escaped, as a result of the sinking, this area of pollution was greatly extended.

Fairly extensive bird mortality was observed along the shore as well. The chief species affected were

Old Squaw, Horned Grebe and Red-breasted Margansers. Since the dead birds were completely coated with oil identification was difficult. It was evident to all concerned that a massive clean up operation was necessary and a Task Force was assembled and given the financial resources and authority to tackle the job. Before reviewing this next phase of proceedings I will comment on some of the activities that occurred between the grounding of the ARROW and the appointment of the Task Force some 16 days later.

#### FAILURE TO REPORT

Although the ARROW grounded on a rock within Canadian waters at 9:35 on the morning of February 4th, it was not until almost noon when her Captain reported the grounding to any Canadian authority. When the report did come it was to the effect that there was no immediate danger and he hoped to get his ship off the Rock at high tide that evening. It should have been obvious to the Master and his officers that the ARROW was hard aground and that a tremendous pollution potential existed and every effort taken immediately to avoid or minimize it. Instead the Captain kept the ship's engines full astern for the whole day while the ship grated and twisted over the Rock enlarging the apertures in her bottom. It seems that many ships' Masters, when involved in their first major marine disaster, cannot accept the reality of their situation. They apparently will not admit to themselves that they have brought their ship to an end, but tend rather to minimize their plight. Some method must be devised to overcome this psychological barrier and ensure that, in the future, potential pollution incidents are immediately brought to the attention of Canadian authorities. The law must be changed to make this mandatory. At the time of the ARROW grounding there was no such requirement other

than section 6 (2) in Part I of the Oil Pollution Prevention Regulations. These regulations were not designed to cover a potential spill and are of doubtful application to a major disaster of this kind.

#### NO GOVERNMENT CONTROL

Another factor which, in my opinion, contributed to the extent of the pollution in Chedabucto Bay was the failure of Canadian legislation to provide for the immediate exercise of control over the grounded tanker by a competent force with the resources necessary to handle the task. On the morning that the ARROW met her fate there was no Canadian government agency ready to tackle the emergency. Even though Section 495 (c) had been passed by Parliament after the clear warning received from the sinking of the TORREY CANYON on the south coast of England, no funds had been voted by Parliament with which to establish a contingency force under the legislation. The teeth which had been originally inserted in this legislation had unfortunately been taken out by amendment to the Bill before it was passed. This left the Minister with some responsibility but no money or access to it.

Until the Minister was persuaded to pursue his authority under section 495 (c), by proclamation on Friday, February 6th, which was not communicated to Mr. Hornsby until the following evening, there was bound to be some confusion at Port Hawkesbury. The owners of the vessel and its cargo were operating under laws applicable to the marine world under which they were faced with a direct conflict of interest. On the one hand, they were at the outset interested in the salvage of the vessel and its cargo as a great amount of money was involved. On the other hand, they must have had in mind the possibility of civil liability for damage caused to the

shore and its inhabitants arising out of their activities at the scene. And then, of course, there was the moral responsibility of the cargo owner to take what action it could to prevent, minimize and clean up the pollution, as well as the owners' authority and responsibility under the TOVALOP agreements to do the same. Only through government could the people who lived and worked in the area have a say, but government was not yet in a position to represent them.

#### OFF-LOADING ATTEMPT

During this early period when no one was specifically in command of the overall operation, a good deal of time was spent in an attempt to off-load the ARROW's cargo by use of her own pumps. This, of course, necessitated the raising of steam in the boilers which caused difficulty. Captain Madsen in his testimony expressed the opinion that the cargo could not have been pumped in this manner after the ship had broken her back, which he felt probably took place on day One. All of the cargo lines on the forward end of the ship were shattered and the indications which he got during the later discharge of the stern section, was to the effect that the pipe lines there were probably fractured also as they all appeared to be open to the sea. Another indication was that the valves on the after cargo tanks were impossible to turn which suggested that these valves had in fact been knocked out of line when the cargo pipes at the bottom of each tank were displaced. Furthermore, no one that he talked to had actually checked to see whether the cargo lines were broken or not and this was a fairly easy thing to do. If they were broken then they would have been filled with sea water when the valves were opened.

Mr. Kerr and Mr. Partridge, who are not as familiar with this type of ship as Captain Madsen, and who

did not have his extensive experience in the salvage field, felt that an off-loading operation could be maintained until such time as the ship had definitely broken her back on Saturday morning. After that time, in their opinion, the ARROW was incapable of pumping off her cargo. This opinion was subsequently shared by Mr. Hornsby and all others who visited the ship. Captain Madsen, of course, was not at the scene and the Atlantic Salvage people were there. It is therefore very difficult to determine which opinion is more likely to be correct. The importance of the answer to this question, however, points out very clearly the need to have a highly qualified person familiar with the type of ship involved at the scene immediately after the grounding so that an accurate assessment of the situation can be made. Captain Madsen says that he would have immediately assembled the necessary equipment to lift the whole ship on a bubble of air to free it from its predicament. This procedure was in fact adopted by Atlantic Salvage four days later after the ship had been broken in two. We know now that refloating of the stern section was not successful but we can only speculate as to whether refloating of the whole ship would have been successful had it been commenced on day One.

On Saturday evening, however, Mr. Costeletos, the owner's naval architect, was of opinion that the cargo still could have been off-loaded by use of the ship's pumps. I am satisfied from all the evidence that this opinion was unfounded. Coming from the source that it did, however, it could not be disregarded by those at the scene and as a result it was resolved to take a second look at the ship the next day before proceeding with a plan to separate the stern section as suggested by Atlantic Salvage Limited. The time required for the second look may very well have delayed subsequent operations and is the type of delay that must be avoided in the future. This can only be done by a

clear cut decision-making authority supported by competent technical advice being placed immediately at the scene of the disaster with authority to exercise complete control over the entire operation.

THE ON-SCENE COMMANDER

Some criticism has been directed against Mr. Hornsby for the manner in which he conducted operations at Port Hawkesbury during this period. This criticism emanates mainly from the representatives of the owners of the ARROW, but has also been expressed by some of the scientific personnel at the scene. The complaint of the scientific group was not directed against Mr. Hornsby personally but rather was an expression of their frustrations during an emergency. It is best summarized in a report filed on February 17th, 1970 by Dr. Thomas as follows:

"The organization of efforts to minimize the effects of disaster was inadequate at all times. Transportation, communication and general coordination were rudimentary. Those present did not possess all the required information on salvage or clean up and there was much conflict of authority. This suggests that responsibility for the organization at such disasters must be vested in a Government of Canada body which could be effective. The Department of National Defence appears to be the logical choice as they could handle transportation, people and communication rapidly. Appropriate experts from other governmental departments and private organizations could work through such a body."

The complaints of the owners' representatives, however, were to the effect that Mr. Hornsby was failing to make prompt decisions as required of the on-scene commander and that this caused a general delay and uncertainty with the conduct of the operations.

To the extent that these complaints, both of the owners' representatives and of the scientific group,

attribute any failure on the part of Mr. Hornsby to carry out his assigned responsibilities, they are unfounded. To the extent that they point out a need for a more suitable type of emergency organization for the future, they are sound. It must be remembered that Mr. Hornsby at no time expected to become involved in a major pollution disaster of this magnitude, nor did he pretend to have any special qualifications for such a post. He simply attended at the site pursuant to his minimal responsibility for the enforcement of the oil pollution prevention regulations, to act as an observer of what was taking place. The Atlantic Salvage and Imperial Oil people were assuming responsibility for the operation at the beginning as representatives of the ship owners, the cargo owners, and their insurers. When he was in fact notified of his new responsibility to act as on-scene commander pursuant to the Minister's declaration under section 495 (c) of the Canada Shipping Act, his position was still not absolutely clear. Imperial Oil forces were acting as agents of the Crown and although he was the senior Government official at Port Hawkesbury, all major decisions had to be cleared through the Deputy Minister at Ottawa.

Apart from the allegation of Messrs. Kerr and Partridge that Mr. Hornsby did not clearly communicate his approval of their plan to refloat the stern section, there is no suggestion of any inadequacy on the part of Mr. Hornsby in fulfilling his role. Priorities were promptly determined, requests for equipment promptly filled, and excellent use made of the limited resources available to the group. It was natural that demands for communications and other such services by the many people doing so many important jobs would far exceed the facilities available at Chedabucto Bay, but this did not result from any lack of effort made by officials at the scene.

As far as the Atlantic Salvage complaint to

the effect that they were not given the complete go ahead with their plan to refloat the stern section, I say again that it was merely a misunderstanding. Mr. Hornsby and all others concerned were under the impression that permission to proceed had been given along with certain reservations, as to the release of oil and destination of the tow which would be settled as the operations progressed. Messrs. Kerr and Partridge felt that their plan had been turned down. They did proceed, however, and with encouragement from Mr. Evans, made plans to undertake the operation and, in my opinion, their misunderstanding was not the source of any delay. It was the storm that caused the delay of the refloating operation and the final sinking of the ship.

Rather than criticism, high praise should be given to all of those persons who worked themselves to exhaustion in making a valiant effort in an attempt to prevent and minimize the pollution being caused by the grounding of the ARROW. They were working against time and making the best of the facilities available to them. They were working on a task unfamiliar to them and in a spirit of cooperation generated by the emergency. Their actions should be judged in the light of these conditions.

#### THE OWNERS

There was also some criticism of the action taken by the owners of the ARROW who were responsible for the incident in the first place. It was, of course, their Captain who had been negligent and their ship that was polluting the shores of Nova Scotia. This ship was owned by a company with no other assets and operated under a set up that would prevent any effective claim being made to recover damages should the ship itself be destroyed. The owners were, however, a party to the Tanker Owners Voluntary Agreement concerning liability for oil pollution set up by international tanker owners after



the TORREY CANYON disaster in England in 1967, and although this arrangement was only available as a means of recovery by a national government expending funds in the clean up of an oil spill, it did provide a source of funds roughly equivalent to the amount for which an owner would be liable under the limitation of liability provisions of the Canada Shipping Act. I will deal with this TOVALOP agreement in more detail at a later stage. The owners were also indirectly represented at Chedabucto Bay by Mr. Kerr, who was dispatched there by their insurers. As soon as salvage of the vessel became known to be impossible, his responsibility was to take whatever action was necessary to prevent or minimize pollution. The owners were also represented at the scene in the early days by Imperial Oil Limited. Although Imperial Oil felt a moral responsibility to dispatch personnel to Port Hawkesbury to do whatever could be done to prevent the escape of their cargo from the ship, their action was confirmed by the owners who undertook to be responsible for their costs. In addition, the owners dispatched some of their key men from New York, Monte Carlo and Greece to Chedabucto Bay, and even though their presence did little to resolve the problems, it cannot be said that the owner callously abandoned its ship or tried to avoid responsibility for the damage caused.

#### NO CONTINGENCY PLANS

Another criticism raised at the hearings can be applied equally against the owners and the Canadian government. It was to the effect that no preconceived contingency plan for such an oil spill had been developed and no effective agency established to carry out the plan. The owners' representatives admitted that tankers under their management had been involved in oil spills before and that they were familiar with the major oil spill caused by the grounding of the

TORREY CANYON. Officials of the Department of Transport were in the same position. They had had to deal with spills in coastal waters previously and had realized at the time of the TORREY CANYON incident the need for some plan to handle this sort of spill in the future. Olympic Maritime of Monte Carlo, who admitted they were the managers of the Onassis fleet, which included the ARROW, had assumed no responsibility for the establishment of a contingency plan and maintenance of personnel for its use in the event of a major spill from one of their vessels. Apart from participation in TOVALOP no such plan was prepared and this policy did not change even after the ARROW incident. Their only direction to a Master of one of their ships is to report the grounding immediately to them so that they can arrange for action to be taken in that part of the world where the ship finds itself.

The ARROW was, of course, under a time charter to Esso International and was engaged in transporting cargo for Imperial Oil. Imperial Oil Limited had realized the need to develop plans for the protection of the environment and in 1969 had prepared an oil spill clean up manual to guide their personnel in attacking spills caused by their company's operations throughout the country. They had a central committee in Toronto and regional committees throughout Canada prepared to go into action as soon as receiving notification of a spill. They are one of the few companies dealing with petroleum products that had advanced their contingency plan to this stage.

Imperial Oil's manual was not designed, however, to cope with a situation such as that which occurred at Chedabucto Bay. Although the organization was there, not sufficient technical research had been conducted to attack the problems of Bunker "C" spilled in a cold marine environment.

The Department of Transport had realized the

need for such a plan after the TORREY CANYON and submitted amendments to the Canada Shipping Act to Parliament authorizing the Minister to step in and take charge of a potential pollution situation. Apparently the legislators were not as impressed with the seriousness of the situation as the senior members of the Department of Transport and the provision in the legislation authorizing the recovery of monies expended was deleted.

"495D. All expenses incurred by

- (a) the Minister in removing, destroying or selling a vessel, its cargo or fuel pursuant to section 495C,
- (b) Her Majesty in preventing the spreading of any cargo or fuel that has escaped or been discharged from a vessel, and
- (c) Her Majesty in cleaning any property fouled by any cargo or fuel that has escaped or been discharged from a vessel,

shall constitute a debt due to Her Majesty by

- (d) the owner, the charterer and the master of the vessel at the time it became distressed or stranded or was wrecked, sunk or abandoned, as the case may be; or
- (e) the person whose act or fault or whose servants' act or fault caused the distress, stranding, wrecking, sinking or abandoning of the vessel or the escape or discharge of the cargo or fuel from the vessel."

This left the Minister with no source of funds to back up his new legislative responsibility. The mood of Parliament permeated the Civil Service and efforts which had been commenced to establish an overall attack on pollution made little headway and as a result when the ARROW grounded on February 4th, 1970 there was no contingency plan under which government forces could attack the problem. At that time, such a spill was not considered to be a government responsibility. Its clean up was left to the owner of the

ship and its cargo spurred on by the cajolry of the Department.

Apparently no real lesson was learned from the TORREY CANYON disaster or the major oil spills that preceded it. The attitude that it can't happen here prevailed and the voices of those who called out, warning of the dangers of pollution were ignored. There was virtually no preparation in Canada for such a marine disaster. It is hoped that the lesson has now been brought home and that Canada will never again be unprepared in this field.

#### THE ARROW'S CONDITION

Strong positions were taken throughout the hearings concerning the condition of the ARROW and her equipment. At Phase I of this Inquiry it was determined that the cause of the grounding was the negligent navigation by the Captain of the ship. It was, of course, his responsibility to navigate his ship in the light of conditions existing at the time, including the condition of the ship and its equipment. It does not necessarily follow, however, that his error of judgment could not have been avoided if his ship had been better equipped with navigational aids. Nor can it be said that the condition of the ship did not contribute to the extent of the pollution of Chedabucto Bay. I put these propositions in the negative because there is no evidence to confirm them. We can only look at the facts and base probative arguments upon them.

The captain of the TORREY CANYON had under his command a new ship containing all of the latest electronic aids to navigation and yet he managed to ground a fully loaded 120 thousand ton tanker on a well known rock on the south coast of England, spilling her cargo of fuel oil in the English Channel and polluting both the shores of England and France.

The Captain of the ARROW was sailing a 22-year old vessel carrying 16 thousand tons, ill-equipped with navigational aids when he grounded his ship on Cerberus Rock in Chedabucto Bay. In both cases the responsibility for the grounding falls on the Captain who could and should have avoided these navigational hazards by the exercise of proper skills and procedures as a navigator. In the case of the ARROW, however, the Master did not have available to him as many aids to navigation and it can be argued that if he had this additional electronic assistance he may have been warned of his predicament before it was too late to avoid the tragedy.

The radar set on the ARROW was not functioning properly. It had been spoking or sectoring during the previous month and was more than useless to the navigator. It was, in fact hazardous to use it as spurious blips were being shown causing nothing but uncertainty. The Master should not have been using the radar at all. Had the set been working, however, he may have avoided the grounding.

The ARROW was not equipped with either Loran or Decca, two of the most modern aids to navigation. Once again it can be argued that electronic navigational systems which were available at Chedabucto Bay might have prevented the disaster if the ARROW had been supplied with equipment for their use.

The second proposition deals with the condition of the ARROW and whether it may have contributed to the extent of the pollution. Once again a comparison may be made. The TORREY CANYON ripped the bottom of her forward tanks when she hit the rock and continued to spill her cargo during the nine days she remained on the rock before she broke her back, when another 50 thousand tons of crude oil was spilled into the seas. She was a new ship. The ARROW was about the oldest ship in her fleet. At her last major inspection period she

had had her deck plates renewed but subsequently on different voyages had suffered damage. On her voyage from Aruba to Salem on December 27th, 1969 high seas damaged the hatch of number 7 port cargo tank and pipes were broken. When she arrived in Salem oil was found to be escaping from a rivet on her starboard side near number 6 tank. After her fatal grounding, oil was escaping from the vent pipe above the foredeck and its condition was such that attempts to plug the holes were unsuccessful. There was also an aperture in number 4 hatch coaming through which oil escaped into the sea.

The emergency diesel generator was not working and had not been in order since the Master took command. Had it been working, the attempts to raise steam on board would have been greatly assisted. There was also evidence that the watertight doors on the front bulk head of the poop deck were twisted and caused difficulty when it was necessary to make them watertight, and that valves on the tanks of the after deck could not be moved due to distortion of the reach rods. Whether these last two circumstances were due to the condition of the ship or were damaged when the ship grounded is a matter of conjecture. Captain Madsen was of opinion that the ship was sound and that the damage observed was caused by the grounding. He found no weakness in the structure of the ship which would have contributed to the escape of oil apart from the damage caused as a result of the grounding.

The main check on the condition of ships such as the ARROW is done by classification societies such as the American Bureau of Shipping. Surveys are conducted in three year intervals and classifications assigned on the basis of these surveys. The standards that must be maintained by the ships are dictated by the requirements of their insurers and the International Conventions for the Safety of Life at Sea.

Additional supervision of the condition of

these tankers is carried out by Esso International. Captain Madsen described how they satisfy themselves that tankers they charter meet warranties as to fuel consumption, speed, pumping performance, etcetera. This programme of inspection was only begun in 1968 and therefore it did not apply to the ARROW itself but is now done before any new ship is taken on charter.

The only international agreement dealing with oil pollution was established to prevent or control the deliberate dumping of oil into the sea and does not establish any standards of navigation, construction or equipment aimed at the prevention or minimization of major oil spills.

It is impossible to say that any consideration has been given to the prevention or minimization of the hazard of a major oil spill in the establishment of classifications assigned by associations such as the American Bureau of Shipping or in the granting of certificates of compliance with any of the existing international conventions controlling ships at sea. Nor is the inspection being made by the charterers directed towards this end. Should increased standards or requirements be necessary, a new international agreement will have to be reached, or unilateral regulations adopted for the passage of ships through Canadian waters. The international approach, is, of course, the most desirable since oil can flow for hundreds of miles on the surface of the sea before polluting a land mass. Agreements of this nature, however, are slow in realization and the other alternative may be necessary as a stop-gap measure.

#### GOVERNMENT PARTICIPATION

The fact that there was no government organization in existence prepared and authorized to deal with the potential pollution threat caused by the grounding of the

ARROW does not mean that there was any lack of governmental participation in the efforts to minimize that threat. The federal departments of Transport, National Defence, Fishery and Forestry, Energy Mines and Resources assigned personnel and equipment to the areas as soon as the threat to the ecology became apparent. Many of the Departments of the Government of the Province of Nova Scotia pitched in as well. There was no lack of desire on behalf of government agencies and personnel to assist in this calamity, but their efforts were not conducted on an organized basis during the early days of the affair.



## CHAPTER 14

### THE TASK FORCE

By February 13 the shores of Chedabucto Bay were heavily polluted with oil that had escaped from the grounded tanker ARROW and the initial efforts of the owners of the ship and the cargo to remove the potential of further pollution which remained in the stern section of the ship had failed. The enormity of the problem of cleaning up the Bay and handling the sunken wreck had been realized by the Minister of Transport and his senior advisors at the time of his visit to the area that day. The resources already committed to the problem were obviously insufficient and the fact that it was the first major spill in this country left the Minister with no previous experience or knowledgeable personnel to fall back on. Nor were there any funds authorized by Parliament to deal with this unique situation.

A decision was taken to establish a Task Force to attack the problem and give it full authority and backing for such an operation. The full resources of the public services of Canada were made available to the Minister for the selection of the team. By February 20th the three men to head the Task Force had been chosen.

Dr. Patrick Duncan McTaggart-Cowan, the executive director of the Science Council of Canada was chosen to act as chairman of the Task Force. Before assuming his executive post with the Science Council of Canada, he had been president of a Canadian university and from 1959 to 1963 had been head of the Meteorological Service of Canada. He held a B.A. in Mathematics and Physics from the University of British Columbia and a Bachelor's Degree in Natural Science from Oxford. During the last war he was on loan from the Canadian Government to the Royal Air Force where he acted as Command Meteorological Officer of the R.A.F. Ferry Command.

In recognition for these wartime services he was subsequently awarded a degree of Doctor of Science by the University of British Columbia.

Dr. H. Sheffer, the vice-chairman of the Defence Research Board of Canada, was named Deputy head of the Task Force. He possessed a Ph.D. degree in chemistry and a great deal of administrative experience.

Captain (N) M. A. Martin, the Deputy Chief of Staff (Combat Readiness) Maritime Command Headquarters, Canadian Armed Forces, was the third member selected for the Task Force. He was a highly qualified naval officer, knowledgeable in the field of combined military operations making use of land, sea and air forces simultaneously.

The Minister's verbal instructions to the Task Force were "to deal with the oil in the wreck, the oil on the water and the oil on the shore, and, having done that, to write a report telling him how we could do better next time in the kind of preparedness we should have for future cases."

The Task Force went to work immediately. Dr. McTaggart-Cowan assigned his librarian at the Science Council to the task of perusing the world's literature on oil spills in cold environments and then they headed for Halifax, where they met with Commodore Morrow of Maritime Command on February 21st, and were briefed on the situation to date by the key people involved. Mr. Weston was asked to outline in general but briefly what had happened to date at Chedabucto Bay, which he did. Other briefings were presented as well and the Task Force began to formulate some organizational plans. They immediately realized the need to set up a headquarters for the operation at Port Hawkesbury and discussed the type of facilities they would require with Maritime Command before they left for the scene. Now that the Task Force had taken over, Mr. Weston and the local Department of Transport

officials were relieved of their former obligations, but from then on were assigned the task of providing administrative support to the Task Force. Imperial Oil Limited offered their services and it was agreed that Mr. O'Connell would be assigned to Port Hawkesbury to assist in the future operations. The Task Force moved directly to Port Hawkesbury that day and set up headquarters in the Port Hawkesbury motel. During the evening Mr. Weston described to them in detail Captain Madsen's plan for removing oil from the stern section of the ARROW, while they were in the process of determining their initial options, and planning their attack on their assignment.

The Task Force mobilized vast forces for the clean up of the oil in and around Chedabucto Bay. There was hardly a discipline recognized in the sciences and engineering faculties of the universities that was not represented. The Armed Services and the Department of Transport produced ships, seamen, divers, communications experts, vehicles, helicopters, and technicians. Scientists were recruited at the universities and through the Departments of Fisheries, Energy Mines and Resources, the Bedford Institute of Oceanography, the Fisheries Research Board and wherever else necessary.

Captain Svend Madsen was invited to return to Port Hawkesbury and then assigned to the task of removing the remainder of the cargo from the sunken ARROW by the method which he had been developing. To assist in this operation, the American Salvage tug CURB was chartered and the Canadian naval divers brought to the scene. The oil barge IRVING WHALE was equipped to lighten the wreck by use of the 'hot tap' method devised by Captain Madsen.

Communications were one of the initial problems encountered as so many people were drawn to the scene and this problem was overcome by cooperation among the Coast Guard, R.C.M.P., marine radio and the mobile aircraft control tower brought to the area. Different frequencies assigned to

these groups made the problem more difficult than it would have been had there been a common frequency available, but their skills were used to overcome this deficiency.

The Emergency Measures Organization of Nova Scotia turned out to be an organization which greatly assisted the Task Force. Dr. McTaggart-Cowan says that they seemed to be able to know where to find the myriad of odd items required by Operation Oil (as it became known), and were usually able to effect very prompt delivery.

An intensive meteorological system was necessary and supplementary stations had to be established around Chedabucto Bay. To maintain this service meteorologists had to be seconded from military stations and carry out this work during what would normally have been their periods of leave.

Dr. William L. Ford was selected to head up the scientific coordination team for the Task Force. He was then the director of the Atlantic Oceanographic Laboratory of the Bedford Institute of Oceanography and took immediate leave of this post in order to devote his full time to Operation Oil. Working with the scientific coordinator on the team were

Executive Assistant - Mr. K. B. Yuen, Headquarters,  
Marine Science Branch, Department of Energy  
Mines and Resources

Chemical Science - Dr. A. Y. MacLean, Nova Scotia  
Technical College

Environmental Sciences (Physical) - Dr. C. S. Mason,  
Atlantic Oceanographic Laboratory, Marine  
Scientists Branch, Department of Energy Mines  
and Resources

Environmental Sciences (Ecological) - Dr. R. W.  
Trites, Marine Ecological Laboratory,  
Fisheries Research Board of Canada

Clean Up Technology - Dr. W. D. Jamieson, Atlantic  
Research, Atlantic Regional Laboratory,  
National Research Council.

A scientific liaison officer was established at Port Hawkesbury to maintain communication between the Task Force and the scientific coordination team. An ad hoc advisory committee of senior officers of participating organizations was convened to review progress with the scientific coordination team and to ensure that measures for cooperation and coordination were commensurate with the task ahead. The members of this committee were

Dr. J. E. Blanchard, President, Nova Scotia Research Foundation

Mr. R. N. Gordon, Regional Director, Department of Fisheries and Forestry

Dr. D. R. Idler, Atlantic Regional Director of Research, Fisheries Research Board of Canada

Dr. B. D. Loncarevic, Acting Director, Atlantic Oceanographic Laboratory

Dr. A.C. Neish, Director of Atlantic Regional Laboratory

Dr. J. G. Retallick, Director General, Defence Research Establishment (Atlantic)

Dr. G. A. Riley, Director, Institute of Oceanography, Dalhousie University

Mr. E. L. Rowe, Director, Nova Scotia Water Resources Commission

Mr. G. H. Watson, Wild Life Biologist, Canadian Wild Life Service.

I have enumerated the persons, organizations and resources assigned to Operation Oil to indicate the competence of the forces brought to bear on the problems of Chedabucto Bay by the Task Force. It is not my intention to deal specifically with the detailed activities conducted under Operation Oil as this has been very fully covered by the Report of the Task Force filed with the Minister of Transport on September 1st, 1970. The first volume of their report

deals with what was done by the Task Force to carry out its terms of reference and makes recommendations for the future. The second volume of that report contains the report of the scientific coordination team to the Task Force, which embodies not only the results of their work but also of the research conducted and marks a real Canadian contribution to the world scientific literature dealing with oil spills in cold water areas. Volume three of the report contains individual reports on the many activities conducted during Operation Oil made by the persons or groups assigned to the various tasks.

A tremendous effort was made by all participants in Operation Oil to accomplish their assigned tasks. From the outset it was apparent that there was very little assistance to be derived from the scientific literature of the world as no major oil spill of Bunker "C" fuel had been experienced in cold water temperatures before. Nor had the problem of removing oil from a submerged tanker been encountered. By the time the Task Force took over about 8 thousand tons of the ARROW's cargo had escaped from the ship and the calamity had reached catastrophic proportions. One hundred and ninety of the 375 statute miles of shore line in Chedabucto Bay had been contaminated in varying degrees. The threat from the oil remaining in the sunken stern section presented a real danger of a further massive flow. Fishing, fish operations, bird life, and the marine eco-system were being menaced by oil still floating in the Bay and the effect of this massive pollution on the economy and ecology of this part of Nova Scotia was unknown.

It is only necessary here to deal with the highlights of the Operation. Once the problems were isolated and the options determined, a concerted effort was made by the Task Force to clean up Chedabucto Bay. The efforts continued through the Spring and Summer and to the extent that it was possible to complete such an assignment by the Fall.

Through the tremendous efforts of the team of Navy divers and the many persons assisting them, Captain Madsen was able to remove 1.3 million gallons of the remaining cargo of the ARROW resting on the bottom of the sea and deposit it in the tanks of the IRVING WHALE. This left about a thousand gallons which was subsequently removed when the water was warmer in October. It was, of course, impossible to drain the oil from every nook and cranny in the wreck and small amounts of oil can be seen today coming to the surface especially when the temperature rises or the wreck is disturbed by the action of the sea. The main threat, however, of further pollution from the stern section of the ship has been abated.

There was oil left in the bow section still resting on that part of Cerberus Rock where it had originally been grounded. It was impossible, however, to attack the problem of this oil at the same time as the stern section with the men and equipment available. Consequently, about 500 tons of oil was released from the bow during this period and blown ashore by the gales before anything could be done about it.

The oil that was recovered from the stern section was taken to the Imperial Oil refinery at Dartmouth. It was found to contain a 12 percent water content and this was subsequently removed and the oil readied for re-use.

While plans were proceeding to recover the oil from the wreck the Task Force was trying to determine the best method of dealing with the oil already ashore, the oil approaching shore and the oil mixed with ice. No method was found to deal with the oil in ice problem. It was realized that the ice would eventually melt returning the oil to the water and a programme of containment of this oil was therefore pursued to prevent its spread as much as possible. Dams were built to prevent the flow of oil through the Lennox

Passage and the Canso Tickle. These were areas where there was an alternate method of access. Booms were used in other areas but the state of the art in developing booms was minimal and construction of booms was on the trial and error basis.

Many attempts were made to burn the oil emulsion but it was found that temperatures up to a thousand degrees Farenheit were necessary in order to cause combustion. This made burning virtually impossible.

An attempt was made to design a portable blast furnace for burning the materials accumulated on the shore but this proved ineffective as well. A great deal more research is necessary in this field.

Although it was not the most desirable solution to the problem the oil that was gathered had to be taken to dump sites where it was stored underground, in areas where the heavy clay underburden is impervious to Bunker "C". These areas were difficult to locate and the assistance of the Provincial groundwater and mining people was necessary so there would be no possibility of the oil polluting water resources. The dump sites were covered with clay and then top soil and trees were planted.

Thousands of suggestions were pouring in as a result of the world-wide publicity to the spill about methods of recovering the oil from the water. These were sifted by the members of the Task Force and the scientific coordination team and the most promising technique was one developed on the West Coast following the Santa Barbara spill, known as a 'slick-licker'. Arrangements were made to have a prototype brought in and after a number of design features were altered and the machine greatly strengthened, three more were built. This meant that there were four machines capable of lifting oil from the surface for disposal.



Basically the slick-lickers were made of a conveyor belt which picked up and conveyed the oil on the surface to a wringer similar to the old fashioned wringer-washer and then deposited the oil in a 45 gallon drum. The equipment was mounted on a barge and when the drums on board were filled, they were taken ashore and carted away by trucks to the dump sites. Had these slick-lickers been available earlier, it would have been possible to prevent a good deal of the pollution which found its way ashore.

The scientific coordination team conducted extensive research into the possibility of using chemicals for cleaning the shore pollution. They found that various dispersants on the market had varying degrees of toxicity. The difference between toxicity of the many dispersants and the further difference between the toxicity of different batches of the same commercial dispersants were taken into consideration. The scientists realized that there was a great deal of oil on the shore and that damage had been done to the intertidal zone. From their observations, little damage had been found to the marine fauna and flora in the sublittoral area and in deeper water. The effect of the use of chemical dispersants may have been to bring some toxicity to this area and possibly cause some damage to the fishing industry, it was decided to attack the clean up problem without use of chemicals.

Later research established that some of the chemicals proposed had a very low toxicity themselves, but when they were mixed with the Bunker "C" which was also low on toxicity the combination became moderately toxic. Much more research remains to be done in this field.

When the decision had been made not to use chemical dispersants and burning had been found impractical, the only remaining way to clean the shores and beaches was mechanical. Of the 190 miles of shoreline polluted only 30

miles were attempted to be cleaned. The only areas that could be cleaned were the beach areas and the rocky shores were destined to remain black. Beaches that were lightly oiled were cleaned by using manual labour. 'Slick-Pickers' as they became known, worked their way down this type of beach with shovels placing the globs of oil in plastic bags. These bags were subsequently carted off to dump sites. The heavily fouled beaches had to be cleaned with bulldozers, front end loaders and dump trucks. In some areas the surface material was removed to a depth of four feet and in others just inches. These methods were successful in cleaning the beaches but due to the presence of so much oil on the adjacent rocky shores, they became re-oiled two or three times during the summer.

The remainder of the oil polluting the shores of Chedabucto Bay will remain until nature has removed it by the process of biodegradation. Where the shores and beaches are exposed, the cleaning process will be accelerated. It is not known how many years will be required before the remaining evidence of the ARROW disaster will be removed from the coastline. One year has already passed and many of the beaches that were cleaned have been re-oiled. There is still some oil coming to the surface from the wreck and other oil is being moved about from one location on the shoreline to another. The shore is still black.

The Task Force also attacked the problem of cleaning fishing gear fouled by the ARROW's cargo. The fishing vessel PIERRE STE. HELENE was the first to report the oiling of her seine net. These nets are worth about 25 thousand dollars and once fouled cannot be used. Their replacement would require a time lag of many months and this would mean that many fishermen would be unable to earn their livelihood during the regular fishing season. The scientific

coordination team were able to design and have constructed a large laundromat, at a cost of 22 thousand dollars, capable of cleaning these seine nets. Already 200 thousand dollars worth of gear has been cleaned with this piece of equipment and the job was completed with such dispatch that very little time was lost from the fishery.

Cleaning wharves and boats by steam was found to be efficient, but, of course, oil was dumped back into the sea in the course of the process. It was later found that this could be absorbed by placing peat moss in the water and then recovered with the slick-lickers before further pollution was caused.

While the Task Force was conducting Operation Oil, reports were received of heavy oil having reached the shores of Sable Island approximately a hundred miles out on the Atlantic from the scene of the wreck. The importance of determining the origin of this pollution was immediately realized and the scientific coordination team produced a more accurate method of fingerprinting oil than had been previously used. By this 'gas chromatography analysis' they were able to establish that the oil which arrived at Sable Island originated in the cargo tanks of the ARROW. The ability of oil to move such a distance on water before becoming a shore pollutant must be kept in mind when formulating measures to prevent or minimize pollution in the future.

One of the important roles played by the Task Force during their stay at Chedabucto Bay was in the field of public relations. The residents of the area naturally were dismayed by the calamity and a great deal of misinformation was being spread around. The Task Force Commander and the public relations team met with local residents and their leaders and let them know what was being done. Where possible, they invited their participation in the decisions concerning

the clean up. They were asked to express their opinion as to whether they would prefer the possibility of pollution in a highly developed area as against the inconvenience of a dam. They were asked to keep the Task Force informed of the information they were acquiring and were encouraged to continue with their fishing activities rather than give up in despair. Qualified people were brought to give advice and the residents were given every assurance that no effort would be spared to overcome their plight.

By taking the people of Chedabucto Bay into their confidence, the Task Force received their cooperation in exchange. Many a misunderstanding was avoided and the fishery continued in a normal way.

The Public Relations group dealt also with the national and world press. Organized arrangements were made to meet the demanding requirements of the media who brought home the real tragedy of such pollution to all Canadians and the citizens of other countries bordering on the sea.

Although the work of the Task Force was substantially completed by September 1st, 1970, at the time it filed its report some of its work still goes on. During the Fall the remainder of the oil that was pumpable was removed from the stern section at a period when the temperature of the water was highest. The dams constructed to prevent pollution will eventually have to be removed. The research into the many problems created by this oil spill and the clean up procedures attempted continues and the scientific assessments of the effect of the spill on the ecology of the area remains to be completed.

In the opinion of Your Commissioner the appointment of the Task Force to clean up the mess deposited in Chedabucto Bay by the grounded tanker ARROW was absolutely necessary. The small force provided by the owners of the ship

and the owners of the cargo and the Government at the outset did everything they could under the circumstances to minimize pollution damage, but they were unable to cope with the myriad of problems created when they failed to contain or dispose of the ARROW's cargo. The Task Force moved in with extensive resources in the form of manpower and funds and did what had to be done to alleviate the situation. They used their scientific and technical abilities to remove the balance of the threat both from the sunken ARROW and the oil emulsion floating on the surface. Mechanically they cleaned the beaches and the fishing gear fouled by Bunker "C". The members of the Task Force and the many hundreds of people who assisted are to be congratulated for their excellent service rendered at Chedabucto Bay. It is fallacy to suggest that the oil spill caused by the ARROW has been cleaned up. The Task Force realized at the outset that all they could expect to do was remove the pollutant that was recoverable. Nor was there any chance of cleaning more than 15 percent of the total polluted coastline. Only the sandy beaches could be cleaned without using dispersants and the other 160 miles of rocky coast remained as black as the day when the oil first reached the shores. The oil is still there and will remain for years to come. Beaches once cleaned will be re-oiled, although not as heavily as before. The forces of nature will determine when the last evidence of the ARROW will disappear from Chedabucto Bay.

## CHAPTER 15

### DAMAGE

The real damage caused by an oil spill is not always apparent. The potential damage that may be caused by a future spill is difficult to comprehend. In this chapter I will deal with the actual damage to the marine and shore environment demonstrated at Chedabucto Bay as a result of the ARROW spill and the possibilities that may be expected from spills in the future. I will also deal with the costs associated with this type of pollution and the chances of their recovery.

### OIL AS A POLLUTANT

We were fortunate in having available to the Commission not only the extensive reports of the scientific coordination team of the Task Force and the evidence of Dr. Ford and some of its other members, but the personal attendance of Dr. Molly Spooner as well. Dr. Spooner, who is associated with the Marine Biological Association of the United Kingdom, at the Marine laboratory at Plymouth, is one of the world's leading authorities in the field of marine biology. She has participated in the extensive research conducted following the TORREY CANYON incident in 1967 and was associated with her husband in the production of the report TORREY CANYON POLLUTION AND MARINE LIFE published in 1968 by the Plymouth Laboratory. This work which is filed as Exhibit P38, with the records of this Commission, is the most comprehensive scientific study on marine pollution by oil yet published.

Dr. Spooner participated as a consultant in many other oil spills. The spill of the GENERAL COLOCOTRONIS

at Eleuthera in the Bahamas is one example. She and her husband attended on behalf of the West of England Shipping Federation and attempted to see that the situation was handled better than the TORREY CANYON catastrophe. She was also asked to go out to a pipe line spill in Saudi Arabia at the request of the Arabian-American Oil Company in May of 1970. She has worked on two spills of bunker oil on the south coast of England, one from the FINA NORVEGE in Plymouth Sound and the other the HEMSLEY on the north Cornish coast. During the summer she acted as consultant to the government of Australia concerning an objection being taken against oil exploration being carried on at the Great Barrier reef. They wanted her opinion as to the likelihood of damage to the coral reef if drilling were permitted in this area.

The extensive experience acquired by Dr. Spooner in her research into these and many previous oil spills has given her a broad knowledge of the subject.

A review of some of the factors common to this type of catastrophe will enable us to understand more clearly the true effect of the ARROW's spill in Chedabucto Bay. From the work of the Scientific Coordination team and the evidence of experts in this field the Commission is satisfied that the following facts are material to a full understanding of the problem.

Oil is a complex mixture of hydrocarbons containing appreciable quantities of sulphur and traces of metals. When it is brought to a refinery in its crude form it is subjected to a series of distillations to separate the different components or fractions of the oil. The lighter fractions such as gasoline and kerosene are the most volatile. The least volatile portion commonly known as pitch remains after separation of the lighter fractions and is used as a basis of either Bunker "C" fuel oil or asphalt. In order to determine the desired viscosity and sulphur content of the Bunker "C"

the pitch is blended with more volatile fractions of the oil separated during earlier stages of the distillation process.

There are many different kinds of crude oil. They vary considerably in the distribution of the light and heavy fractions and also in the degree of aromatic content. This variation applies to the refined products as well. The extremely well purified products may be quite harmless, such as parafin, but those fractions having a high aromatic content are immediately toxic and the number 2 fuel oil, for example, which has a 41 percent aromatic content was responsible for the extreme kills caused by a recent spill at West Falmouth, Massachusetts. Most lighter fuel oils do have a rather high aromatic content and consequently are highly toxic. Bunker "C", on the other hand, does not appear to have much immediate toxicity. The lighter fractions are also more volatile and present the threat of fire or explosion in the event of a spill. They evaporate more rapidly than the lower fractions in which evaporation is minimal, and combustion is very difficult.

The specific gravity of Bunker "C" oil is close to that of water and it has a tendency to mix with water. Its viscosity is very high making pumping and other forms of handling extremely difficult. When this type of oil is spilled in salt water it has a strong tendency to form a stable water-in-oil emulsion.

The length of time that oil remains in water is also important. If it has been weathered and has had plenty of time to lose any lighter fractions, it will be far less toxic than immediate fresh crude. The lighter ends will be lost by evaporation. In the case of Bunker "C" which is commonly known as number 6 oil many of the lighter fractions have already been removed by the refining process, and the toxicity removed in this way.

The most highly refined fractions of the oil



evaporate very quickly and provide little toxicity. Their greatest danger is through their volatile quality. The number 2 fuel oil such as diesel oil has the highest aromatic content and presents the most immediate toxic effects. The lower fractions present the least toxicity. They are almost impossible to burn when emulsified with water and the highly viscous nature of the emulsion makes it difficult to handle.

The pour point of Bunker "C" of the type carried in the ARROW was 30 degrees Fahrenheit. The freezing point of sea water of normal salinity is about 28.5 degrees F. At the time of the grounding of the ARROW the oil in her tanks was being carried at about 135 degrees F and as I mentioned earlier, the temperature of this oil would reduce by about 16 degrees each 24 hours after it ceased to be heated, with a somewhat lesser heat loss each day. The oil in contact with the skin of the ship where the water temperature was below the pour point of the fuel would congeal and gradually a layer of solid oil would develop around the outer surface of the fuel. The thicker this layer became the slower the rate of cooling and this is why the ARROW's tanks could still be pumped some five weeks after the grounding. It is also why some congealed oil would remain after the pump out and have to be removed when temperatures increased at a later date.

Once oil becomes mixed in water a series of changes takes place. Not too much is known about the exact nature of these changes but depending on the type of oil involved either an oil-in-water emulsion or water-in-oil mixture results. Some water-in-oil emulsions may contain up to 80 percent water and even though the mass of the oil may have been appreciably reduced by evaporation, after a long period at sea the bulk of the emulsified material may yet exceed that of the original oil. In Chedabucto Bay the emulsion of Bunker "C" oil and sea water contained from 33 to 53 percent water. Such a water-in-oil emulsion has been

compared to butter, whereas an oil-in-water emulsion compares to milk. An oil-in-water emulsion develops when the oil is split into such small particles that the scattered parts will not re-aggregate. In this form the oil is in the best possible state for attack by oil-consuming bacteria which will eventually destroy any that is not evaporated.

A water-in-oil emulsion may be converted to an oil-in-water emulsion by the use of detergents, or as they are better known today, dispersants. This was the technique used on the Cornish beaches after the TORREY CANYON spill. The dispersants merely break down the oil into minute particles so that natural degradation through bacterial action can follow. They do not in any way destroy the oil itself.

Unfortunately dispersants themselves contain a high proportion of aromatics. The higher the proportion of aromatics the more effective it is as a solvent but at the same time the more toxic. Where the preservation of marine life is important the use of dispersants to speed up the clean up of the oil is undesirable.

Once the oil escapes into the sea, there are only four ways by which it may disappear. Firstly, it may be physically removed or burnt. Secondly, the lighter fractions may evaporate or thirdly, they may go into solution. These dissolved oils are initially highly toxic but are quickly dispersed by currents and diffusion and diluted to a nontoxic level. Fourthly, the remaining residue will be subject to oxidation by chemical processes or by bacteria. The latter process is known as biological degradation. The rate of degradation is generally slow but will vary depending upon many environmental factors including temperature, wind, wave action and the degree of dispersion of the oil.

All methods of removing the oil are affected by the type and stability of the emulsion resulting after the oil enters the sea. The Bunker "C" oil spilled from the ARROW

formed a very stable emulsion. This type of emulsion made burning very difficult, made the use of dispersants less effective, even if they were to be used, and hindered the use of absorption agents such as peat moss, eel grass and straw. The 'stiffness' of the emulsion, however, did assist in the mechanical removal of the contamination from the water and the shore and probably prevented some contamination of sandy beaches because it would cut down the tendency of the oil to flow through sand.

The emulsification of the oil led to a marked increase of viscosity over that of the original Bunker "C". Experiments conducted by the scientific coordination team established that such an emulsion could only be burned after pre-heating to a thousand degrees Fahrenheit and by introduction of air to counteract the release of water vapour which tended to 'blanket' the flame. They established as well that the presence of water in the oil cut down the ability of peat moss to absorb oil and decreased the tendency of the oil to spread.

Microscopic examination of the emulsion of oil emanating from the ARROW made four months after the grounding established that there were considerable colonies of bacteria present in the minute water droplets in the emulsion.

I mentioned previously that chemical oxidation was one possible means of the destruction of the oil. This is believed to be a process of photo-oxidation utilizing the energy of ultraviolet light. Since this form of light does not penetrate any appreciable depth of water, the process will only take place near the surface or on shore. It is most effective in the tropics and might be a significant factor in our climate in summer, but this remains to be established.

Biodegradation is the main hope for the destruction of the oil polluting the shores of Chedabucto Bay.

The bacteria attack the lighter fractions of oil most eagerly but those who go for the heavy and more complicated molecules are very slow in acting. Whether or not this type of bacteria is present and the time required to destroy the oil remains to be seen.

Some of the oil may disappear without being oxidized away. It may become buried in the sediments on the bottom and put out of action in that manner. Another possibility is the uptake of some of the oil by flora and fauna. It may disappear into the bodies of plants and animals. Researchers established that the lower fractions of oil are not very toxic to marine organisms directly but there may be some serious sublethal effects in the long term. Fish and other marine animals that ingest the oil may become tainted and unmarketable because of their oily smell but this condition is usually cleared up in a matter of months. After the fish have rid themselves of the oil they can be harvested and sold without difficulty, as no trace of the oil can be smelled or tasted by the purchaser.

A difference of opinion has developed, however, in the scientific community concerning the long term dangers to the public by the consumption of fish and other sea animals that have been exposed to an oil polluted environment. Some of the heavier fractions of the oil come within the category of potential carcinogens or cancer producing agents. When these substances are taken up by marine organisms they are held in the fatty tissues of the animals rather than being excreted. These hydrocarbons are not removed by prolonged residence in clean water. This is precisely the same as the DDT story. The carcinogens like DDT continue to accumulate and if the animal is eaten its entire load is passed on to the predator. Thus the concentration at higher levels of the food chain can be increased by several orders of magnitude.

Dr. Max Blumer, the senior scientist in the Department of Chemistry at Woods Hole Oceanographic Institute in Massachusetts, is recognized as one of the world's leading hydrocarbon chemists. He has done extensive research into the effects of oil on marine life and has reached the conclusion that crude oil and petroleum products are toxic to most or all marine organisms. He argues that petroleum hydrocarbons are persistent poisons that enter the marine food chain and are stabilized in the lipids of marine organisms. They are then transferred from prey to predator. Dr. Blumer states that the marine ecology is damaged by oil pollution in the following ways:

1. direct of kill of organisms through coating and asphyxiation.
2. direct kill through contact poisoning of organisms.
3. direct kill through exposure to the water soluble toxic compounds of oil at some distance in space and time from the accident.
4. destruction of the generally more sensitive juvenile forms of organisms.
5. destruction of the food sources of higher species.
6. incorporation of sublethal amounts of oil and oil products into organisms resulting in reduced resistance to infection and other stresses.
7. incorporation of carcinogenic and potentially mutagenic chemicals into marine organisms.
8. low level effects that may interrupt any of the numerous events necessary for the propagation of marine species and for the survival of those species which stand higher in the marine food web.

Dr. Blumer estimates that present practices in tanker ballasting introduce about 3 million tons of petroleum into the ocean each year and the pumping of bilges by other vessels contributes another 500 thousand tons. Inport losses from loading and unloading contribute another estimated million tons and if you add to this the amount of oil spilled in the

sea from accidents such as the ARROW, TORREY CANYON, spills in harbours such as that at West Falmouth, Massachusetts, losses during exploration and production such as those at Santa Barbara and the Gulf of Mexico, spills from storage tank and pipe line breaks, and from untreated domestic and industrial wastes, between five and ten million tons of oil are dumped into the marine environment annually. He therefore puts forth a very strong argument in favour of measures to prevent any further spills in the sea. In pursuing his argument he stresses the hazard to public health through human consumption of the accumulated carcinogens and it is at this point where other scientists disagree.

Dr. Molly Spooner states that these carcinogens may be found naturally in oysters and other shell fish and are not necessarily produced from oil pollution. She does not quarrel with Dr. Blumer's chemical identification of the hydrocarbons in marine organisms but attempts to place their presence in a broader perspective. The only place where she has heard of any direct connection between cancer and consumption of fish products is in Iceland where a high incidence of stomach cancer was associated with a similar high intake of smoked fish. There was, however, no oil present in these fish and she attributes the carcinogenic factor to the smoking of the fish. Dr. Spooner states that the same material, 3-4 benzpyrene, that was isolated by Dr. Blumer as the carcinogenic agent, is very prevalent when autumn leaves are burned, or when food is cooked on a Bar-B-Q. People are exposed to this hazard in many ways at all times.

If fish or water should be polluted by oil directly, then of course consumption is restricted by the fact that they would be tainted by smell and taste. The storage of potential carcinogenic compounds in the fatty tissue of animals does not grant this protection however, since no smell or taste warns of its presence. This, of course, is one of the more

cogent aspects of Dr. Blumer's argument.

Dr. A. E. Martin, M.D., D. Ph., senior medical officer of the Department of Health and Social Security in Great Britain, dealt with the possible connection between cancer and oil pollution at a Symposium at Avonmore. He cited the known incidences of a connection between cancer and certain occupations such as chimney sweeps, tar workers and engineering workers subject to oil contamination. Further research conducted between the First and Second World Wars established that tar could produce cancer of the skin when painted on rabbits and mice and that the responsible agents were polycyclic hydrocarbons present in the fractions with higher boiling points. In 1933 a potent carcinogen was isolated as 3:4 benzpyrene in tar and others were subsequently identified both in tar, soot and mineral oils. Today many other chemical substances and physical causes have been found to produce various forms of cancer in industrial workers.

Small amounts of the polycyclic carcinogenic hydrocarbons including 3:4 benzpyrene are normally found in drinking water supplies. About ten times as much is in the polluted air in urban communities. Very little information is available on the amount of intake from food. Dr. Martin also takes the position that a very small amount of oil in drinking water or food would make it undrinkable and not edible. This, of course, does not apply to the accumulations of hydrocarbons in tissue which can neither be smelt or tasted.

Dr. Martin points out that the number of cancers where a chemical or physical agent can be implicated in man is very small and in view of the state of research in this field, it is difficult to judge the importance of many of the carcinogens which occur in our environment. He concludes that every effort should be made to prevent contamination of drinking water supplies by oil and suggests that more

information is required through research on the effect of various quantities of polycyclic hydrocarbons.

Dr. A. Y. MacLean of the Chemical Engineering Department of Nova Scotia Technical College attended the Brussels Conference at which Dr. Blumer presented his paper. He felt that Dr. Blumer had overstated his case and did not believe that there was any scientific data presented upon which the inference could be drawn that any human had in fact received cancer from oil.

From all the evidence made available to the Commission, the connection between oil spills in the marine environment and cancer on humans is a possibility, but one requiring a great deal more research before any firm conclusion can be reached.

Another matter of concern is the effect of the total concentration of oil in the oceans of the world. It is known that vast quantities of oil are deposited in the ocean from many sources each year but the estimates vary. Dr. Spooner felt that about 3 million tons reached the sea where Dr. Blumer placed the estimate from 5 to 10 million tons. Dr. Ford, the head of the Scientific Coordination team, states that insufficient investigation has been conducted in order to determine the quantity or the effect such pollution is having on the waters of the world. Whether the oil dumped into the sea is being naturally destroyed and having no effect on marine ecology or whether the point has been reached where no more oil can be received in the oceans without causing serious damage is unknown. All agree, however, that there is potential danger and every effort should be made to prevent further discharge into the ocean.

Now that I have reviewed generally the effect of the introduction of oil into the marine environment, I will deal specifically with the scientific findings resulting from the ARROW's spill in Chedabucto Bay.



DAMAGE TO MARINE ENVIRONMENT AT CHEDABUCTO BAY

The spilling of the cargo of Bunker "C" oil from the tanks of the ARROW left Chedabucto Bay with heavy concentrations of oil-in-water emulsions on the shore line. There was oil present in the water column and on the sea bottom, although the concentrations there were very low.

Observations of the intertidal zone revealed that oil was adhering to periwinkles and barnacles but the species were all alive. Although common algae were in many cases completely oiled, subsequent observations revealed no indication of direct toxic effects on mature or juvenile plants. Periwinkles appeared to be migrating from oiled to clean locations.

Soft shell clams suffered about 20 percent mortality. This appeared to be from suffocation from the oil rather than toxicity. The clams moved up their rows to evade the pools of oil that had drained down and if they survived were unresponsive, although they subsequently recovered with long exposure to air. As a matter of public safety these clam beds which were non-commercial were closed. No further mortalities occurred after June but the beds remained closed and further study will be conducted before reopening.

Studies of the sublittoral zone were conducted by divers between low water mark and depths of 70 feet. Thirty-three areas were surveyed and oil was found on the bottom in only two of those areas. Oil particles and globules are most abundant in the surf zones, and near the surface. In another area surveyed subsequently off the Canso shore where there was 25 percent shore pollution, oil was found resting on and floating just above the bottom three or four feet below mean low water.

Few lobsters were observed in the early stages. When the water temperature rose they began to appear. The lobsters were clean and normal in behaviour, although one was

found with oil on the ventral surface. Scallops were sampled close to heavily oiled beaches, cooked and eaten with no evidence of contamination. From visual examination there was no conclusive evidence of any significant damage to the sublittoral fauna or flora in Chedabucto Bay.

Chemical analysis of a variety of animals (clams, scallops, periwinkles, sea urchins, etc.) revealed that oil was present not only in the digestive tract but in other organs as well as the muscle tissues, and examination of sculpins taken from the sublittoral zone in areas where globules were present on the bottom revealed that oil was present in the faeces but not on the gills.

Early in March zooplankton samples were obtained from the upper waters throughout Chedabucto Bay and visually examined for oil. They appeared to have ingested an oillike substance and chemical analysis of the faeces showed 2.4 percent Bunker "C". The animals containing these small particles voided them within 24 hours and showed no signs of distress. The oil passed through largely unaltered, was defacated with other undigested food, remained in the form of faecal pellets considerably denser than sea water and therefore sank. In the opinion of the Scientific Coordination team this may constitute an important natural clean up process of oil in the sea as the pellets contain a concentrated bacterial flora which should hasten degradation.

Approximately one thousand fishermen earn their livelihood at Chedabucto Bay in a variety of fisheries including ground fish, lobster, mackerel, herring, smelts, salmon and other less important species. The lobster fishery was the most important part of the inshore fishery. There are also four fish processing plants that normally employ about 800 shore workers in the vicinity. These plants use

large quantities of water and one of them was totally dependent upon the sea for its cleaning process. Until suitable filter systems could be installed the threat of contamination was always present.

The lobster season was due to open April 1st and it was obvious that the danger of contamination had to be determined. Only small amounts of oil were found on the lobster grounds and tests were conducted to determine whether or not the lobster fishery would be effected. It was concluded that the meat and tamale of lobsters in Chedabucto Bay would not be tainted by the oil and that any oiling of the exterior of the lobsters could be cleaned by immersion in running sea water.

The Scientific Coordination team has concluded that there is no evidence to date that the ARROW oil spill in Chedabucto Bay has altered the yield of commercial fisheries in the area in any way. The major problems have been with contamination of fishing gear, ships, docks and other equipment.

Observations were made on seals, both at Chedabucto Bay and Sable Island. About 5 percent were found dead and the cause of death was from suffocation rather than any toxic effects of the oil.

Estimates of the mortality of bird life caused by the oil are difficult. The Canadian Wildlife Service has estimated that about two thousand birds died in Chedabucto Bay and another possible 5 thousand at Sable Island. The mortality will not, however, affect any particular species.

Some sheep became oiled along some of the Cape Breton shore where sheep have access to the seaweed but autopsies established that the death of four sheep could not be attributed to ingestion of oil. The oiled seaweed, however, was considered a hazard to the sheep and its fleece and fences

were erected as a preventive measure.

The spilling of 16 thousand tons of Bunker "C" oil in the waters of Chedabucto Bay does not appear to have had any substantial effect on the marine ecology of the area or upon its fishery based economy. Apart from the possible sublethal effect of the carcinogens that may have been taken up by marine organisms, the flora and fauna were not substantially damaged, and whether or not a public health danger exists in the long term cannot yet be determined. The fact that the type of oil being carried by the ARROW was of a low toxicity and dispersants were not used to any great extent, has helped to minimize the damage. Had the cargo been number 2 fuel or one similar to it and dispersants used, the damage could have been devastating.

#### DAMAGE TO SHORE ENVIRONMENT AROUND CHEDABUCTO BAY

I will deal in this section with the effect of the ARROW oil spill on the lives of the many people who inhabited the shores of Chedabucto Bay.

Damage to the fishing industry in the area was pretty well limited to the fouling of some nets, boats and fishing gear. Suitable arrangements were fortunately made by the Task Force to clean the nets and gear and a normal catch of lobsters and ground fish was experienced. The men who follow the sea did, however, suffer some inconvenience and are continuing to do so. They were left with the problem of cleaning their boats and the rearrangement of their patterns of movement by the construction of dams and booms to prevent further oil pollution. It was, of course, impossible to keep the oil from their lines and clothing and even their dogs became fouled and had to be cleaned. Some compensation was paid for the economic loss that could be shown by the fishermen as a result of their disrupted operations. But nothing could

be done about the miserable conditions caused by the presence of the oil and the fishermen simply had to suffer through them.

No actual damage was suffered by the fish processing plants around the Bay, but the potential of damage was so great that extreme measures to prevent it had to be taken. Alternative supplies of water for washing their product had to be obtained in two cases and in a third where no alternate supply was available, a filtration system had to be developed to make certain that the fish would not be tainted by the use of sea water in the cleaning process. These services were provided by Government through the Task Force and did not represent any actual damage suffered by the plants themselves.

No actual damage was established to the farming industry of that part of the Province. There were some scares and it was thought for a while that some sheep were being killed as a result of contact with the oil on the shore. The Scientific Coordination team established that the death of the sheep had been caused by worms and not by the presence of oil. It was, however, necessary to fence off some areas so that sheep would not come in contact with the oil on the beaches and damage their fleece.

One of the main industries of Nova Scotia is tourism, and some of the polluted beaches would normally have been used by tourists during the summer season. These beaches were included in the areas attempted to be cleaned by the Task Force but their subsequent reciling lowered their usefulness as a tourist amenity during the 1970 season. It is impossible to say, however, whether the fouling of the shores of Chedabucto Bay by the ARROW's oil in any way minimized the numbers of tourists visiting the area or caused any damage to the industry as a whole.

The persons who suffered the most as a result of the oil spill from the ARROW are those who live in and around

Chedabucto Bay. They have suffered the full inconvenience and aesthetic disturbance generated by the spill. They are the ones who had to put up with the period of uncertainty as to the oil's effect on their livelihood. The housewives are the ones who had to do the extra cleaning when their children and their pets brought the oil indoors. Sources of water used for washing for generations had to be abandoned and new supplies found. Their beaches cannot be used without the threat of contamination and the waters where their children used to swim now have the ever present films of oil which take the real enjoyment out of this amenity. Most of the shoreline is still black and entry to the water over the oil polluted shore is a constant reminder of the damage that can be done by another tragic incident in the future.

It cannot be said that some people did not receive some direct benefit from the ARROW catastrophe. Many of the people of the area received employment which they may not otherwise have had. A tremendous demand for motels and other services in the area was generated by the emergency. I am certain, however, that even those few who received some benefit would join the vast majority of the people of Chedabucto Bay in insisting that every precaution be taken to prevent such an event occurring anywhere in this country in the years ahead.

The people of the area were given an opportunity to appear before a public hearing of the Commission held at Port Hawkesbury on October 15, 1970 to express their views. A joint submission was made to the Commission by Very Rev. A. P. Poirier speaking on behalf of the many organizations in the area and the local residents as well. He spoke for the Municipality of the County of Richmond, the Isle Madame Board of Trade, the Knights of Columbus Council #4607, the Arichat Lions Club, the local branch of the Royal Canadian Legion, the Teacher's Union, the Catholic Women's League and the Students'

Union of the Isle Madame Regional High School. The brief recognized the efforts that had been made through the Task Force to clean up the pollution and felt that everything was done that could have been done under the circumstances. They pointed out very clearly, however, that their beaches were being continuously repolluted by oil still coming from the ARROW and other polluted areas, and felt that the eventual clean up would be conducted by the forces of Nature. The presentation suggested that one or more swimming pools be erected at public expense to compensate the people of the area for what they had suffered. This they felt would be a very modest request under the circumstances. When questioned as to why the request is being made to Government rather than to the owners who caused the damage, they stated that they did not believe there was any way in which recovery could be made against the company which owned the ship.

At the time hearings were conducted in Port Hawkesbury a survey of the condition of the shores of Chedabucto Bay was undertaken by the Commission. What Monsignor Poirier stated in his brief was correct. Oil is still coming from the wreck of the ARROW although in small quantities, and the beaches which were cleaned have been recoiled in many instances. Their complaint is not a frivolous one in the light of the catastrophe which their area suffered through a set of circumstances over which they had no control. Recovery against the owners would be very difficult and they can only look to a governmental body for redress. Before spending any further amounts on shoreline cleaning in the area, I would recommend that serious consideration be given to their request.

#### COSTS OF THE CLEAN UP

The total contribution of the Government of Canada to the cost of minimizing and cleaning up the pollution

damage to Chedabucto Bay caused by the ARROW has been estimated by the marine finance branch of the Department of Transport to be \$3,100,000. This figure includes the out-of-pocket expenses actually paid for in cash together with estimates of the value of the time of other government personnel and agencies, and the use of government equipment. The estimate also provides for the future opening of the Lennox Passage dam and the cost of removing the Canso Tickle dam.

Imperial Oil Limited have estimated their contribution to the clean up to be over \$900,000.00 but no estimate was made of the costs of Atlantic Salvage Limited or other expenses of the owners during the early days after the grounding. Other costs undoubtedly were incurred by the Government of the Province of Nova Scotia and by the local residents who donated a good deal of their time to the cause. The preparation of cost estimates of this type with accuracy is very difficult but it can be seen that very substantial expenditures were made by different bodies in an attempt to clean up the mess caused by the grounding of the ARROW in Chedabucto Bay.

#### RECOVERY OF COSTS

The recovery of costs incurred by the various persons damaged as a result of the ARROW oil spill poses very difficult problems. The normal action in rem against the ship itself would be of no assistance since the wreck of the ARROW now lays at the bottom and is of no value. The alternative of an action against the owners of the ARROW for damages caused by the negligence of their master would be little better. The company that owned the ARROW was incorporated in Panama and as far as is known its total assets were the ARROW and one other ship which has subsequently been sold. If an action were brought against this company, Sunstone Marine (SA) of Panama, there would be a limitation of amount that could be recovered



by all claimants pursuant to section 657 of the Canada Shipping Act of the equivalent to one thousand dollars gold francs for each ton of the ship's tonnage. Under the formula set forth for the calculation of this amount, the limitation would work out to approximately \$730,000. The parties to the action would have to establish the causal connection between the negligence of the Master of the ARROW and the damage they suffered and if successful, would be entitled to share in the total amount of the judgment in proportion that their damages bear to the total damages established. Since the company owning the ship has no assets in Canada, it would then be necessary to attempt to enforce the judgment against the owner in Panama and if a suitable procedure for this purpose was available, and the company had assets sufficient to respond to the claim, recovery might be made. If, on the other hand, the company was found to have little or no assets, in fact, it would be impossible to recover.

There is no evidence brought forward at the Inquiry to indicate whether or not the company that owned the ARROW carried public liability insurance which would permit recovery of a judgment against the owners. The evidence did indicate that the owners were members of the TOVALOP scheme but this would not be available as a source of recovery of costs expended in the clean up except by a national government or the owners themselves. The individual claimant, any private company or the Province of Nova Scotia would not have any right to recover its damages under the TOVALOP scheme. The difficulty of recovery of damages which may very well be suffered in substantial amounts by private citizens and companies from oil spills on our coasts, makes it imperative that some better arrangement for their protection should be worked out for the future. In doing so it must be kept in mind that we do not have in Canada the right to seize a sister ship of

the offender to assist in the recovery of a judgment as was done by England in the case of the TORREY CANYON.

TOVALOP

On February 11, 1970, the Canadian Government was advised by letter that Sunstone Marine Panama (SA), the owner of the ARROW, was a participating owner in the Tanker Owners' Voluntary Agreement concerning liability for oil pollution known as TOVALOP. This letter is on file as exhibit P11 and enclosed with it were copies of the TOVALOP agreements filed as exhibits P36 and P37. The letter confirmed that the obligations of Sunstone Marine Panama (SA) under TOVALOP have been insured and gave the names of the insurers.

On February 12, 1970, Mr. Arthur Tripp of London, England, the managing director of the International Tanker Owners' Pollution Federation, the organization which manages TOVALOP, met with the Minister of Transport and Mr. Stead, the associate deputy minister, in Ottawa, and discussed in detail the rights of the Canadian Government to make a claim for the costs of clean up under the TOVALOP arrangement.

TOVALOP is a voluntary organization which was set up by the tanker owners of the world after it was realized that coastal pollution from major oil spills was becoming all too common. A general description of the scheme is set forth in the literature published by the Association as follows:

TOVALOP originated from the determination of certain tanker owners to take constructive action with respect to oil pollution. These owners recognized that marine casualties may, on

occasion, lead to pollution of coast lines, at least when crude oil, fuel oil, heavy diesel oil or lubricating oil is discharged. (For convenience these materials will be referred to simply as "oil"). These owners were aware of the fact that traditional maritime laws and practice do not always provide an adequate means for reimbursing national governments who incur expenditures to avoid or mitigate damage from such pollution, as well as tanker owners who, on their own initiative incur this kind of expenditure. They recognized also that traditional maritime law and practice do not encourage voluntary action by tanker owners, or joint measures by governments and tanker owners, against such pollution.

In an effort to establish responsibility to national governments with respect to these matters, to assure that there will be financial capability to fulfil this responsibility and otherwise to alleviate this situation, these tanker owners have developed an Agreement called "TOVALOP" which is available to all tanker owners throughout the world.

TOVALOP provides that a Participating Tanker Owner will reimburse national governments for expenses reasonably incurred by them to prevent or clean up pollution of coast lines as the result of the negligent discharge of oil from one of his tankers. The tanker causing the discharge is presumed to be negligent unless the owner can establish that discharge occurred without the tanker's fault. The Participating Owner would not, under TOVALOP, reimburse prevention or clean up costs incurred by private parties. However, if a national government spends monies to remove oil from privately owned coast lines, it could, in the case of negligence of the discharging tanker, recover these expenses from the tanker owner.

In the event of a negligent discharge of oil, where the oil pollutes or causes grave and imminent danger of pollution to coast lines within the jurisdiction of a national government, the tanker owner involved is obligated to reimburse the national government concerned for oil removal costs reasonably incurred by it up to a maximum of \$100.00 (U.S.) per gross registered ton of the tanker discharging the oil, or \$10,000,000 (U.S.),

whichever is lesser. If the owner himself also helps remove the oil, his costs in effect result in prorating the government's claim where the combined costs exceed these limits.

TOVALOP also contains provisions for reimbursing a tanker owner for any expenses reasonably incurred by him to prevent or clean up pollution from a discharge of oil. These provisions are designed to encourage a tanker owner to take prompt action to remove or mitigate pollution damage.

TOVALOP applies only to physical contamination to land adjoining waters navigated by tankers including structures built on this land. It doesn't cover fire or explosion damage, consequential damage, or ecological damage.

TOVALOP will be administered by a limited company registered in England, and headquartered in London, which will be called The International Tanker Owners Pollution Federation Limited and each tanker owner who becomes a party to TOVALOP would be a member of this Federation. TOVALOP requires each tanker owner who becomes a party to establish and maintain financial capability to fulfil his contractual obligations described above. The parties to TOVALOP have made provision to establish their financial capability by forming another limited company registered in Bermuda called International Tanker Indemnity Association Limited. This Association will provide insurance coverage for all tankers owned by the Parties to TOVALOP, and thus assure that they would be capable of fulfilling their financial commitments. Alternative coverage may be provided should the Association consider this necessary.

TOVALOP is structured so that all tanker owners of the world can at any time become participants. Tanker owners owning at least 50 per cent of the tankers of the world (excluding tankers owned by a government or government agency and tankers of under 5,000 d.w.t.) as measured by deadweight tonnage must become parties before the principal obligations of an owner under TOVALOP come into existence and TOVALOP itself becomes fully effective, and TOVALOP will lapse if 80 per cent (with the same

exclusions just mentioned) do not become parties at the end of two years after its effective date.

In the case of any disputes, a national government can enforce the liability of a tanker owner who is a party to TOVALOP through arbitration under the Rules of the International Chamber of Commerce. This latter feature should avoid the problems of establishing jurisdiction and effecting collection which exist at present in maritime law and practice.

When a tanker owner becomes a party to TOVALOP he continues in the Agreement for an initial period of five years from its effective date and for successive two-year periods, unless he elects to withdraw at the end of one of these periods. All tanker tonnage (including barges capable of sea-going service) owned or bareboat chartered by a party to the Agreement will be covered, excluding LNG and LPG carriers.

In summary, TOVALOP does the following:-

(1) Encourages immediate remedial action by Participating Tanker Owners in the event of a discharge of oil.

(2) Assures financial capability of Participating Tanker Owners to fulfil their obligations under TOVALOP through insurance coverage.

(3) Avoids jurisdictional problems under existing maritime law and practice.

(4) Places on tanker owner the burden of disproving negligence.

(5) Provides a national government with machinery for making valid claims notwithstanding the fact that such government might not, under international or local law, have a legal obligation to remove oil discharged from a tanker or a legal right to recover removal expenses.

The most important thing to realize about Tovalop is that it is completely a voluntary agreement. The national government is given the privilege of making a claim under its provisions but the national government would have

no right to enforce such a claim should this right to claim at any time be unilaterally withdrawn. Whether or not a claim is paid rests in the control of the Association who at the present time will refer any disputes to arbitration. There is, however, nothing to prevent the agreement being changed by those who have control of it in the future.

The second thing to realize about TOVALOP is that it was brought into force after 50 percent of the world's tanker tonnage accepted the Agreements on October 6, 1969. It will cease on October 6, 1971 unless at that time 80 percent of the tanker tonnage has accepted membership. The situation today is that slightly more than 80 percent are members but as the world tonnage increased this percentage will fluctuate. Should the required percentage be reached at the appropriate time, then members who have joined initially for a five year period would be expected to remain as participants during that period at least. There is provision that they may withdraw should any amendment to the Agreement be made which is unsatisfactory to them and undoubtedly they would be forced to withdraw if they refused to pay their dues.

TOVALOP limits the amount to be paid per pollution incident to \$100.00 U.S. per gross registered ton of the vessel from which the discharge was made, or a maximum of \$10,000,000. The amount which would be paid as a result of the ARROW spill would be approximately \$1,200,000.00 and under the Agreement, if the Canadian Government makes a claim within one year from the date of the grounding of the ARROW the \$1,200,000 will be shareable between it and the owners to the extent that each participated in the clean up of the spill. When Mr. Tripp testified at the hearings on November 24, 1970, the Canadian Government had not, in his opinion, made such a claim. It had merely given notice of its intention to pursue a claim. Any claim that is made would, of course, have to be made against Sunstone Marine (SA) of Panama

and not against the Federation, and any amount validly paid to the Canadian Government by the owners would be recoverable under the Agreement from the Association.

The establishment of a claim under TOVALOP is not as simple as would appear on the surface. The definition of damage by pollution is limited to physical contamination damage to coast lines resulting directly from a discharge of oil and does not include damage from fire or explosion, or consequential damage or ecological impairment. It could thus be argued that many of the scientific efforts taken to prevent ecological damage to the Chedabucto Bay area would not be properly included in the costs covered by the scheme. Another difficulty is presented when it is realized that the costs of the clean up and efforts made to prevent pollution must be shared ratably between the Canadian Government and the owners. The question must therefore be raised as to what expenses come within the category of owners' costs. Does this include the costs of Imperial Oil Limited which are alleged to have been incurred both as representatives of the owners and as agents of the Crown? Does it include the costs of Atlantic Salvage Limited, who were attempting to prevent pollution as the representatives of the owners and TOVALOP? Are the expenses incurred by Olympic Maritime Limited in sending personnel to the scene to be included as well? These and other questions which are difficult to answer will probably mean that it will be necessary to resort to arbitration proceedings as permitted under the Agreement before the matter can be finally settled.

Any private citizen or corporation carrying on business in this country, who may have been damaged by an oil pollution incident, has, of course, no right to claim against the owners under the TOVALOP arrangement.

It is the opinion of the Commission that a voluntary arrangement for insuring tankers' liability for oil

pollution incidents like that of TOVALOP is not a satisfactory method for the recovery of damages suffered as a result of an oil spill. The right of persons and governments to recover should be clearly established and suitable legislation enacted to establish the financial responsibility of tanker owners using Canadian waters and an efficient procedure to see that this responsibility is carried out.

### CRISTAL

The oil companies have recently developed a voluntary agreement similar to TOVALOP which provides funds for the payment of claims up to 30 million dollars to persons suffering damage resulting from an oil incident. It is called CRISTAL after the first letters of its name, which is Contract Regarding An Interim Supplement to Tanker Liability for Oil Pollution.

The preamble to the CRISTAL agreement recites that it is designed to cover the period until the International Convention on Civil Liability for Oil Pollution and the International Convention creating an International Compensation Fund are brought into force. The money required to finance this arrangement will be produced by levies against the oil companies involved. In order to bring CRISTAL into operation, 50 percent of the world receipts for crude fuel oil must be represented by parties to the Agreement, and the Agreement will cease to exist if, at the end of two years, this figure has not reached 80 percent. The contract is to be interpreted under the laws of England whose courts have been given exclusive jurisdiction.

The compensation payable under CRISTAL is the amount of damage incurred, not to exceed 30 million dollars less the amount payable under TOVALOP to a government, less



the expenditures entitled to be made by the owner for the removal of oil under TOVALOP, and less owners' liability under the laws of the place.

In the opinion of the Commission a voluntary agreement such as CRISTAL is not a suitable method of ensuring that persons damaged by oil pollution incidents are compensated.

## CHAPTER 16

### OIL POLLUTION IN THE YEARS AHEAD

All types of petroleum products will be carried through Canadian waters in the future. The volume of world tanker tonnage is increasing at the rate of 12 per cent per year and the size of the individual carrying units is continually increasing as the era of the supertanker has arrived. We now know the extensive damage that can be caused by the wreck of a relatively small tanker like the ARROW, but it is difficult to comprehend the tremendous potential for damage contained in a 200 thousand ton tanker carrying petroleum of a highly toxic variety.

To place the future threat in perspective, it is necessary to review a few statistics. In 1960 the world shipping tonnage of tankers was 62.9 million tons deadweight. By 1969 this had increased to 127 million tons deadweight and it is expected to increase by 1975 to 183.5 and by 1980 to 289.7 million tons deadweight. In other words the next ten years will see a more than doubling of the world tanker tonnage.

During the next decade it is expected that the world tanker cargo tonnage which increased from 440 million tons in 1958 to 1120 million tons in 1968 will double as well. A very high concentration of this world traffic sails the North Atlantic and will be passing within Canadian waters or within polluting distance of Canadian shores.

In 1961 the world fleet of tankers was composed of 2671 vessels, having an average size of 22 thousand tons. By 1969 this had increased to 2991 vessels of an average size of 40 thousand tons. In 1961, there were 316 tankers on order averaging in size 45 thousand tons each and

in 1969 the order book showed 379 vessels having an average size of 150 thousand tons. Many of the tankers coming out of shipyards today exceed 200 thousand tons and some are being planned at the 500 thousand ton level.

Shipping casualties have increased with the increase in world shipping tonnage. In 1969, 327 vessels of all kinds totalling 824,978 tons gross were lost including 18 tankers totalling 330,513 tons gross or 40 percent of the total losses. This increased to 617 vessels between September '69 and September '70.

Long before the ARROW was ever heard of by the residents of Chedabucto Bay, a large oil refinery was being constructed and plans were being made for a super-port in the area. Tankers of the 200 thousand ton class with drafts of up to 80 feet were scheduled to begin deliveries to the refinery by August 1970 and Port Hawkesbury is expected to become one of the major shipping centres on the Atlantic coast.

158,937,000 barrels of oil moved through east coast waters in 1969 to Atlantic and St. Lawrence River ports. The break down is as follows:

Imported crude oil	50,320,000 barrels
Imported clean products	24,097,000 barrels
Imported heavy fuel oil	24,573,000 barrels
East coast transfers	59,907,000 barrels

These developments are only one indication of the increasing hazard from potential oil spills in Canadian waters.

The construction of oil producing wells in the Arctic and the transportation of that oil from there to the West coast of the United States poses a similar increasing threat of oil pollution on the Canadian Pacific Coast. Any spill of this oil which would be in its crude form would be extremely damaging to the marine ecology off the shores of

British Columbia, and in the opinion of the Commission every effort should be made to avoid this hazard.

Extensive oil exploration is now taking place off the shores of the Atlantic Provinces and should producing wells be established, we will be faced with the possibility of damaging spills of the kind experienced at Santa Barbara and in the Gulf of Mexico. We have already had evidence to indicate that oil from the ARROW was taken by wind and currents a distance of over a hundred miles to Sable Island and there is no reason to believe that a spill from an off-shore well would not find its way to our coastline.

As the volume of oil being deposited in the sea increases each year and the likelihood of new and larger spills becomes greater, it is obvious that some method must be found to minimize this terrible potential for harm to our environment.

CHAPTER 17

ACTION ALREADY TAKEN

If the ARROW disaster accomplished nothing else it did bring home to the people of Canada, its Parliament and its Government, the serious threat to the environment from potential oil spills. Already a great deal of activity has taken place in an attempt to minimize this threat. No more will those who follow the sea remain in their own isolated world. Their activities have come in conflict with the rights of those on shore and the role of the international shipping community will have to be reassessed. The day when the activities of one ship are judged only in relation to its effects on other ships and people at sea has gone. The sea can no longer be treated as an inexhaustible container for the disposal of waste nor can anything which interferes with the propagation of life in the sea be treated indifferently. Oil pollution in the oceans is reaching the point where it may very well be interfering with the ocean's potential as a supplier of food for the world's population and oil pollution in coastal areas can cause serious damage to the ecology, economy and amenities of our country.

Many recommendations have been made to the Canadian Government as a result of experience gained from the ARROW spill. Some of the recommendations came from citizens-at-large suggesting ways of preventing future oil pollution and dealing with the clean up. Other recommendations came from members of the Government department like Mr. Hornsby who had the initial responsibility for dealing with the ARROW spill. Then there were the formal recommendations submitted to the Minister by the Task Force pursuant to their terms of reference, and there were, of course, many

recommendations submitted to this Commission by the various experts called and parties represented.

#### THE ARCTIC BILL

Shortly after the ARROW incident, one of the large international oil companies based in the United States started conducting experiments with the transport of oil by supertanker through the Arctic Ocean. The S.S. MANHATTAN was designed to withstand the ice conditions expected in Arctic navigation and an attempt was made to sail her from the Atlantic to the Canadian Arctic as an experiment to see whether this would be a suitable and economic means of transportation of the oil expected to be recovered there. With the ARROW catastrophe fresh in their minds, Members of Parliament immediately realized the tremendous potential harm that could be caused by a major spill under Arctic ice conditions, and strong legislative action was taken in the form of the passage of the Arctic Bill. This became the Arctic Waters Pollution Prevention Act assented to June 26, 1970, part of the preamble of which is as follows:

"And whereas Parliament at the present time recognizes and is determined to fulfil its obligation to see that the natural resources of the Canadian Arctic are developed and exploited, and the Arctic waters adjacent to the mainland and islands of the Canadian Arctic are navigated only in a manner that takes cognizance of Canada's responsibility for the welfare of the Eskimo and the other inhabitants of the Canadian Arctic and the preservation of the peculiar ecological balance that now exists in the water, ice and land areas of the Canadian Arctic."

The Act prohibited the deposit of any waste in Arctic waters a distance of one hundred miles from shore from ships or land based operations, and made the owners of ships and their cargos and persons conducting land based operations civilly liable for any such discharge. This lia-

bility was made absolute and not dependent upon any proof of fault or negligence. Financial responsibility was required to be posted by potential polluters and extensive powers were granted to the Governor-in-Council to make regulations for the control of navigation and the construction of ships sailing in Arctic waters. Provisions for policing the Act were included and substantial penalties to insure its enforcement.

The unilateral establishment of a hundred mile limit in Arctic waters was considered by some members of the international community to be beyond the legislative jurisdiction of the Canadian Parliament. This argument was not accepted, however, by Canadian authorities and from the ecological point of view this makes good sense. Marine ecology cannot be protected by the ancient concept of freedom of the seas, and international agreements will have to be negotiated which recognize this fact.

#### INTERIM FEDERAL CONTINGENCY PLAN

In July of 1970 the Canadian Government issued an Interim Federal Contingency Plan for Combatting Oil and Toxic Material Spills and a copy of this plan has been filed with the Commission. The plan deals only with the federal participation in oil spills, particularly in the Arctic, the East and West coastal areas and the Great Lakes international zone. The need for a more comprehensive contingency plan covering the whole country is recognized and negotiations are being conducted with the Provinces and the United States government towards this end. By July of 1970 sufficient technological information was not available to back up the plan but a committee has been established to produce a comprehensive field manual setting forth the best current methodology for combatting spills of oil and other toxic materials.

The Interim Contingency Plan does provide procedures for the immediate reporting of oil spills and the preselection of on-scene commanders in different regions of the country. Provision is made for the immediate attendance at the scene of the on-scene commander and sufficient technical people to properly assess the magnitude of the spill. Once this is done the on-scene commander then has established channels of communication through which the necessary forces can be mustered to combat the incident.

The Interim Plan recognizes that costs will be incurred and makes provision for suitable records being kept of these. The position is taken that these costs should eventually be recovered from the polluter.

An Interim Interdepartmental Committee on Contingency Planning composed of representatives of the Federal Department of Energy Mines and Resources, Fisheries and Forestry, Indian Affairs and Northern Development, National Defence including Emergency Measures Organization, National Health and Welfare and Transport is established under the Interim Plan and their responsibility is to

- a) establish predesignated on-scene coordinators and regional coordinators,
- b) develop a containment and clean up team capable of quick transportation to the scene,
- c) foster research into the effect of pollutants on the environment and the development of new technology for identification, containment and clean up of spilled substances,
- d) initiate negotiations with the Provinces for the development of a fully coordinated national contingency plan.



NEW AIDS TO NAVIGATION SYSTEM FOR CHEDABUCTO BAY

When Gulf Oil Canada Limited decided to build a large oil refinery at Port Hawkesbury they advised the Federal Government of their intention to supply this refinery with crude oil transported in supertankers having a draft of up to 79 feet. Their requirements would necessitate a large number of trips per year by these sizeable ships and a suitable navigation system was requested. The development of other industries in the area forecast additional increase in the volume of shipping entering and leaving the Port Hawkesbury area and it became necessary for the marine works branch of the Department of Transport to face a situation which they had never experienced before. The problem was tackled by the navigation specialists in the Branch and according to Captain Mahoney, who testified at the hearings, they came up with what they felt was a system of aids to navigation which was as nearly foolproof as they could make it. The planning for this change in navigational aids in Chedabucto Bay was, of course, done before the ARROW incident and its establishment was not related to it. The plan is, however, indicative of the approach being taken by the Department of Transport in establishing a safer navigational system for supertankers carrying pollutants through Canadian waters.

The deep draft of these large oil carrying ships has required new routes to be found for their passage. Areas that were never considered shoals before where the water is 15 or 16 fathoms deep are now to be avoided. The first task of the navigational specialists was to determine a route through Chedabucto Bay and into the docking facilities at Port Tupper, deep enough to permit passage of fully loaded supertankers. They realized that most of the large tankers would be coming around the tip of South Africa from the Persian

Gulf and following a great circle route towards Chedabucto Bay. A safe approach to the Bay had to be established and this was done by means of the development of new and more sophisticated charts and the use of electronic aids to navigation. Both Loran, the long distance electronic navigational aid, and Decca chains are available in the area and receiving equipment will be installed on the ships. With the use of these two aids there should be, in the opinion of Captain Mahoney, no difficulty in establishing good position fixes in the off-shore area as a ship makes its landfall near Chedabucto Bay. There is a Decca line that can be identified at least fifty miles off shore and followed directly into the Bay. This Decca line is backed up by a radio beacon which could be used to follow the same course should any malfunction occur in the ship's Decca or shore station. The ship would also have its Loran for fixing its position all this time.

The ship follows this predetermined course into Chedabucto Bay until it reaches the point where an alteration of course becomes necessary. The first course is marked by a Fairway buoy equipped with a light and electric whistle or horn which will operate whether there is any sea running or not, and a radar transponder which is an electronic device that plants a radar display or a code on the ship's radar. This identifies the buoy and the ship's position. The course from the Fairway buoy into the Bay is marked by a series of centre line buoys similarly constructed and the chart requires ships inbound to pass to the north of the heavy line running through these buoys and outbound ships to pass to the south. There is, therefore, a traffic separation scheme with a centre line that should not be crossed, designed to minimize the possibility of collision in the approaches to Chedabucto Bay.

When an incoming ship reaches the last buoy

in the approach series, the channel alters to the northwest and from that point on the new channel is buoyed by normal red and black channel buoys fitted with lights and radar reflectors. This continues into the loading terminal at Wright Point.

From the time a ship alters course to enter the inner channel he will have the assistance of range lights and day marks on both ends of each course.

The lights will be automated and a control centre will be established at Eddy Point. From this centre a radar check on the positions of all buoys can be made at any time as this control centre works in conjunction with another radar established near the town of Canso which will assist in the position checking of all buoys.

The new charts which have been prepared by the Canadian Hydrographic Service to show this new navigational system also contain a heavy blue line marking very clearly the 15 fathom depth areas. This is an additional aid to the navigator of deep draft ships which shows him immediately all areas that must be avoided.

In order to counteract icing conditions during the winter months on the buoys set up under this system, a combined buoy tender and pilot boat will be stationed in the area. This boat will be capable of deicing buoys at a moments notice and will be of high speed design. The buoys will be of a new type devised by the Department of Transport engineers in conjunction with the National Research Council to minimize icing and cause ice already formed to clear itself from the buoy. The only problem which has not been overcome is the problem of drift ice which may cause the buoys to be lifted during certain periods in the winter.

About 360 ship movements a year are expected to enter and leave the Port Hawkesbury area. Two hundred and forty of these will be generated by the Gulf Refinery. Another

1500 ships of all sizes are expected to pass through the Canso Causeway lock per year. No plans have been made for any bridge to bridge or ship to shore traffic control in Chedabucto Bay of the kind maintained by the Department in areas of higher density traffic such as the main harbours and St. Lawrence Seaway.

Pilotage limits have now been established at Chedabucto Bay and a pilot boat provided. It will now be necessary for ships to accept pilotage service while well out into the Bay on a line between Green Island and Fox Island.

#### IMCO

Canada has been one of the members of IMCO, the Inter-Governmental Maritime Consultative Organization since it began in 1958. It is the specialized agency of the United Nations concerned solely with maritime affairs. Nearly 70 states are members of IMCO today.

The United Nations Maritime Conference held in Geneva in 1948 reflected the wish of maritime nations to consolidate the diverse forms of international cooperation which had grown up over the years in the world of shipping. The IMCO convention was the result. Until at least 21 states including 7 with at least one million gross tons of shipping each accepted the convention on March 17, 1958 it was not in force but after acceptance the first IMCO Assembly was held in London on January 1959.

The Assembly normally meets in London once every two years and its council meets twice a year. Canada is a member of the council.

The Maritime Safety Committee of IMCO is elected by the Assembly for the term of four years, and Canada is also a member of this committee. Its field of work covers aids to navigation, construction and equipment of ships, rules

for preventing collisions at sea, dangerous cargoes, maritime safety procedures and requirements, maritime casualty studies, search and rescue, and many other matters connected with maritime safety. It also deals with the prevention of pollution of the sea by oil.

The Secretariat of IMCO is located at the London Headquarters. The technical division of the Secretariat under the guidance of the Secretariat of the Maritime Safety Committee is divided into three sections, ship construction, navigation and cargoes and related matters.

IMCO is consultative and advisory in its function. It provides a forum where its members can consult and exchange information on maritime matters and it is responsible for convening international conferences when necessary and for drafting international marine maritime conventions or agreements.

In the field of oil pollution IMCO summoned the international conference that was held in London which drew up the International Convention for the Prevention of Pollution of the Sea by Oil. This Convention came into force in July of 1958 and since 1959 has been administered by IMCO. Another conference was called in 1962 at which certain amendments were adopted extending the scope of the Convention. The stranding of the TORREY CANYON in March 1967 brought to light a number of problems calling for international action. Since that time IMCO has embarked on an intensive programme of studies aimed at solving difficult problems inherent both in the implementing of stricter international rules to prevent pollution by oil and other agents and in taking action after pollution occurs against its effects. Other studies have been conducted in the field of ship design and a special sub-committee has been set up to make recommendations concerning suitable design criteria, constructional standards,

and other safety measures. Some of the principal activities carried on by IMCO since the TORREY CANYON disaster in 1967 have been summarized by representatives of the marine regulations branch of the Department of Transport as follows:-

The Marine Pollution Sub-Committee have carried out considerable research into the question of the prevention of pollution of the sea from the routine bilge and tank cleaning operations carried out by tankers in particular and by all of the ships that use oil as fuel. As a result of these researches, a new regulation was prepared in 1969 which has been recommended for adoption to all signatory countries of the International Oil Pollution Preventing Convention. These regulations in effect will bring into force the "load on top system" through which it is anticipated will have the effect of reducing pollution of the sea by a factor of about 90%.

Although this regulation has not yet been ratified by all signatory countries, IMCO has initiated a further resolution asking that all countries adopt these measures before full ratification of the convention amendment.

The same committee has developed testing and calibration procedures for oily water separators and oil content meters. These are basic instruments that eventually will have to be installed on all ships if the crews are to know if the wastes being discharged from the ship are actually within the limits set out by the convention. This committee has also investigated enforcement policies in use by the various signatory countries to enforce the Oil Pollution Prevention Convention and is presently endeavouring to achieve a better co-ordination in this respect.

A further sub-committee working under IMCO is the Sub-Committee on Ship Design and Equipment which has so far drafted a code for ships carrying dangerous chemicals or other pollutants in bulk. They have in fact drafted two codes; one applicable to existing ship and another code, more stringent, which will apply to all new ships. This sub-committee has also collected data on the means that might be adopted in tankers and other ships to prevent pollution of the sea by collision or stranding; data such as manoeuvring data; stopping data, also data on hull construction, ideal shaft horsepower, number of propellers,

value of lateral thrusters, tests of braking devices, various types of propellers and information of that nature.

The same committee has also produced recommendations concerning safety of automated ships which will have indirect application to the prevention of pollution by disaster. Work is also continuing in the investigation of the design of large tankers in order to ascertain why, when such tankers are void of cargo and are sailing in ballast there have been several tank explosions.

This sub-committee has also been charged with the responsibility of developing future regulations to limit the actual size of cargo tanks in all new tankers. This technical and economical study is well underway and draft regulations are presently being formulated for submission to the Maritimes Safety Committee in February 1971.

Another IMCO Sub-Committee is the Sub-Committee on Dangerous Cargoes which has already prepared detailed standards for containers, used for the transportation, not in bulk, of dangerous or polluting substances. These standards define the required construction of tanks for carrying dangerous gases and other poisons.

This same Sub-Committee on dangerous cargoes also recommends certain methods of safe storage and has prepared operating procedures for ships carrying such cargoes.

IMCO is also active in the field of crew training and navigational safety and have developed a recommendation regarding the fire training of ship's crews and a regulation requiring VHF for marine traffic control areas.

They have also developed a recommendation for improving the interpretation of the collision regulations, that is the "International Regulations for Prevention Collisions at Sea" together with further regulatory changes which would require radar and plotting facilities in all ships of 1,600 gross tons and up; a gyrocompass in ships of 1,600 gross tons and up; echo sounders in ships of 500 gross tons and up; regulations controlling the use of automatic pilot facilities and regulations requiring the carriage of

adequate charts and publications.

It is anticipated that a conference will be held in the fall of 1972 to approve these revisions to the International Regulations for Preventing Collisions at Sea.

There are further recommendations that ships carrying oil or noxious cargo should be fitted with electronic position fixing devices suitable for the trade; that masters and officers make the utmost use of all navigational equipment and test this equipment frequently; that governments encourage the development and use of reliable speed and distance indicators; that governments establish port and advisory services where needed especially in heavy traffic areas or for oil terminals; that governments organize piloting services where this contributes to safety in a more effective way than other means; the governments insure that manoeuvring data should be available on the bridge. This is data defining the stopping distance of the ship and order of the turning circle.

There have been various recommendations on ship routing in the navigational safety field which includes certain Canadian waters and this is probably one of the most significant steps that has been made by IMCO to date. There are now traffic separation schemes established in western European waters and various places around the world. The sub-committee on Navigation Safety is presently considering a proposal respecting special signals for deep draft ships in narrow channels and a review of the regulations regarding the avoidance of the Grand Banks as an especially dangerous area where this is practicable.

Recommendations have also been made regarding representation of all affected governments at marine inquiries after an accident ensues.

IMCO has also decided to convene in 1973 an International Conference on Marine Pollution for the purpose of preparing a suitable international agreement for placing restraints on the contamination of the sea, land and air by ship, vessels and other equipment operating in the marine environment.

Although this brief explains the work being done by IMCO on the subject of pollution it should be noted that there are several other IMCO Sub-Committees that



are engaged in work that relates to the safety of vessels and thereby indirectly relates to the prevention or the possibility of such vessels polluting the sea.

The Marine Regulations Branch of the Ministry of Transport has actively participated in all of these groups at IMCO in an effort to eliminate or reduce the possibility of the pollution of our coast line.

At the Brussels Conference arranged by IMCO in November of 1969 several Conventions were passed. The International Convention Relating to Intervention On The High Seas in Cases of Oil Pollution Casualties authorizes parties to take measures on the high seas as may be necessary to prevent, mitigate or eliminate grave and imminent danger to their coast line or related interests from pollution, or threat of pollution of the sea by oil, following upon a maritime casualty. Provisions are contained in the Convention for the notification of the flag state and person interested in the ships concerned and for the consultation with independent experts to be selected by IMCO before measures are taken. If measures are taken that are more drastic than required to deal with the situation then provision is made for compensation to those injured and disputes can be settled by arbitration and conciliation.

This Convention was to remain open for acceptance until December 31st, 1970 and was to come into force after fifteen states had accepted it. These requirements have not yet been met.

The next Convention adopted at the Conference was the International Convention on Civil Liability for Oil Pollution Damage. This Convention rendered the owner of a ship liable for any pollution damage caused by oil escaping or being discharged from his ship, unless it was caused by an act of war or wilful act of a third person, or negligence of a government authority. The owner is permitted to limit

his liability to the aggregate amount of two thousand francs per ton, not to exceed 210 million francs. This limitation does not apply if the incident occurred as a result of the actual fault or privity of the owner.

To obtain the benefit of the limitation of liability the owner must constitute a fund in the amount of a total sum of his limitation with a court of competent authority in one of the contracting states, and this fund is distributed among all claimants in proportion to their established claims.

The Convention sets forth the procedure for recovery of claims which must be brought within a three year period and also provides for the recovery under judgments in the member state holding the fund without reopening the case on the merits.

This Convention was also scheduled to come into force December 31, 1970 upon the acceptance of it by eight states including five states each with not less than one million gross tons of tanker tonnage. This requirement has not yet been met.

At the same Brussels Conference a resolution was passed in relation to the establishment of an international compensation fund. This resolution noted that the International Convention on Civil Liability for Oil Pollution Damage, 1969, lays down the principle of strict liability and provides for a system of compulsory insurance or other financial guarantee for ships carrying oil in bulk as cargo, but recognizes that this does not afford full protection for victims in all cases. It requested IMCO to prepare a draft for a compensation scheme based upon the existence of an international fund and to convene a conference to consider the scheme during the year 1971.

THE CANADA SHIPPING ACT AMENDMENTS

Bill No. C-2, an Act to amend the Canada Shipping Act, was introduced in the House of Commons on October 19, 1970. This Bill contained substantial amendments designed to make provision for the potential pollution threat to Canadian waters from oil and other pollutants. The Bill applies to all Canadian waters except controlled zones described pursuant to the Arctic Waters Pollution Prevention Act and covers any fishing zones of Canada prescribed pursuant to the Territorial Sea and Fishing Zones Act. The 100 mile limit of the Arctic Act was not attempted in these amendments but rather an approximate 12 mile limit applies.

The Bill gives power to the Governor-in-Council to make regulations prohibiting the discharge of pollutants specified in the regulations from ships and requires the Master to make immediate report of any discharge or threatened discharge to a pollution prevention officer. When the Minister has reasonable cause to believe that a ship is likely to discharge a pollutant, he may take control of the ship and its cargo and remove the hazard.

The Bill further authorizes the Governor-in-Council to make regulations identifying pollutants, prescribing reports to be made by ships' masters setting standards of navigational equipment to be carried by ships carrying pollutants, setting the types and quantities of pollutants that may be carried in particular ships, establishing the fittings and installations required on such ships for handling pollutants, controlling discharge of oily wastes, requiring appropriate nautical publications to be carried, respecting the quality and complement of personnel on board, establishing navigational procedures and practices to be followed as well as loading and unloading procedures, prescribing supplies and equipment for the loading and unloading operations, determining

the records to be kept concerning the pollutants carried, regulating pollution of air by ships, regulating discharge of pollutants by Canadian ships in waters generally, and establishing compulsory traffic routes and other shipping traffic controls for safe navigation in waters to which the Act applies. Provision is then made for the issuance of a certificate to masters of ships that comply with all the regulations made under the law.

The Minister is authorized to appoint pollution prevention officers who may require information from ships entering waters covered by the Bill, and refuse permission to proceed unless the ship complies with all of the regulations. He may direct the route through which such a ship carrying pollutants shall pass and in the event of a discharge of any pollutants, may commandeer other ships in the area to assist in the control and containment of the pollutant.

The owner of the ship carrying a pollutant is liable and the owner of its cargo may be made jointly and severally liable with the ship owner for the costs and expenses of taking action under the Bill and also for all actual loss or damage incurred by the Government of Canada or a Province of any person as a result of a discharge of pollutant into waters to which the Act applies. Such claims shall be taken in the Federal court and a limitation period of two years is imposed. The liability imposed by the Bill is absolute and does not depend upon proof of fault or negligence. A limitation of liability is, however, established by the Bill in the amounts approved by the 1969 International Convention at Brussels, that is two thousand gold francs or \$134.00 for each ton of the ship's tonnage up to a maximum of 210 million gold francs or \$14,000,000.00, if there is absence of any fault or privity on the part of the person or persons being sued. If there is fault on the part of the ship owner or the owner of

of the pollutant, then no limitation of liability exists.

Should the amount of damage suffered exceed the amount that can be recovered under the limitation of liability provisions, a special fund is provided from which recovery can be made. This fund is known as the Maritime Pollution Claims Fund and will be made up of a levy on all oil imported into Canada in bulk and oil shipped from place to place in Canada as bulk cargo of a ship at a rate not exceeding fifteen cents per ton as determined by the Governor-in-Council. The fund shall be used to pay claims against unidentifiable polluters and amounts in excess of liability of identifiable polluters.

Evidence of financial responsibility must be posted with the Minister by ships carrying pollutants to the extent of their limitation of liability.

An administrator of the fund is to be appointed by the Governor-in-Council who will have power to deal with all claims and either make settlement or conduct litigation in accordance with the results of his investigations. Before payment, the administrator takes an assignment of the amount of the judgment and is then responsible for recovering the amount paid out from the person primarily liable if such recovery is possible.

Fishermen who claim to have suffered income loss as a result of a pollution incident may apply to the administrator and a procedure is established for assessing such loss, and when the fishermen's loss has been assessed, it will be paid out of the fund.

Any person or ship that discharges a pollutant in contravention of any regulations made under the Act is liable to a fine not exceeding 100 thousand dollars, and any ship that fails to comply with any reasonable requirement of a pollution prevention officer or an order given by him, is liable to a fine not exceeding 100 thousand dollars.

This Bill to amend the Canada Shipping Act has now been passed by the Canadian Parliament. It is subject to proclamation by the Governor-in-Council and will not come into force until proclaimed. I presume that the many regulations that are to be made pursuant to the Act will have to be settled before the law is brought into operation and the content of these regulations will be influenced by the many people associated with the aftermath of the ARROW incident and the conclusions reached after full and extensive inquiry made by this Commission.

CHAPTER 18

SUMMARY

The ARROW incident exposed the Canadian public to the fact that Canada was completely unprepared for a major oil spill. The TORREY CANYON and other previous spills had not made us realize that it could happen here. The situation in Canada was no different from that in other developed countries of the world where the increase in the number of reported oil spills was causing only the first small steps to be taken in the direction of pollution control. The international shipping community and the oil companies themselves were just beginning to realize the hazard they were creating and had slowly begun to initiate change. The legacy of the ARROW to the people of Canada was the tremendous acceleration of this rate of change. From a position of unpreparedness we have moved rapidly to a position of world leadership in the legislative and physical planning for the prevention, clean up and assignment of responsibility for future oil spills. We have very rapidly come a long way from the situation as it existed on February 4, 1970 when the ARROW grounded in Chedabucto Bay and spilled her cargo of Bunker "C" into Canadian waters. The situation as it then was has been set forth in detail in the earlier chapters of this report and may be very briefly summarized as follows.

The only responsibility assigned by Parliament to government concerning oil spills was the enforcement of the oil pollution prevention regulations made pursuant to Part VIIA of the Canada Shipping Act under which the International Convention for the Prevention of Pollution of the Sea by Oil 1954 had been adopted. Both the Convention and the regulations under the Act were designed to prevent the intentional discharge of oil into the sea, but gave no guidance

for the control of a major spill such as that caused by the grounding of the ARROW.

The Minister had been given power to remove or destroy a stranded vessel polluting Canadian waters under section 495 (c) of the Act, but no funds had been made available for the exercise of this power. Up to the time of the ARROW's grounding, senior government officials had attempted to cajole polluters into cleaning up previous spills but the responsibility still remained in the owner of the ship or the cargo, and personal damages were left to the uncertainties of the law of the sea and the law of the place where the incident occurred for recovery.

The government did not have any preconceived contingency plan in force under which to bring its various resources to bear on the control and clean up of a major oil spill. No research programme was being conducted into the effect of oil spills in the marine environment or into the technology of oil spill containment and clean up.

The owners of the fleet of tankers, to which the ARROW belonged, did not have any oil spill contingency plan either. They took the position that it was impossible for them to maintain a clean up capacity when their ships may get into trouble anywhere in the world and contented themselves with participation in TOVALOP instead. This scheme is not in the opinion of the Commission, however, a satisfactory means of providing the funds necessary for the clean up of a major oil spill.

Imperial Oil Limited in association with its affiliated companies did have an oil spill contingency plan in force. Their plan was not, however, designed for a major oil spill of the size of the ARROW incident. It lacked research into the use of the techniques recommended and was untested in a cold water marine environment such as that



found at Chedabucto Bay.

In the midst of this state of unpreparedness the ARROW was grounded on Cerberus Rock, Chedabucto Bay and began spilling her cargo into Canadian waters. Even though the initial reports from the ship indicated there was no immediate danger, everyone concerned soon began to realize the potential hazard and began to zero in on Port Hawkesbury. Imperial Oil realized that it was its cargo that was beginning to pollute the shores and they put their contingency plan into operation. They began sending men and equipment to the scene. The owners and their insurers at first treated it as a matter of salvage and tried to round up forces to free the ship. They soon realized that the ARROW was beyond salvage and sent representatives there to try to minimize or prevent pollution. The Government dispatched a representative to keep an eye on the situation from its point of view.

From Wednesday, February 4th until Saturday February 7th, the many persons with divergent interests who were assembling at Chedabucto Bay attempted to face the catastrophe with full cooperation. There was no boss giving direction but each group did what it felt necessary. The Imperial Oil forces assembled dispersants, booms, and other equipment known at that time to be useful in fighting oil spills. They also provided the ships and other gear required by Atlantic Salvage Limited in the attempt to off-load the ARROW's cargo. Government representatives assisted in the provision of the various types of equipment becoming necessary in the operation and sent scientific personnel to assist at the scene as well. Although there was no overall direction everybody worked hard at his task and many experiments were conducted in an attempt to find ways of containing, destroying or dispersing the oil.

On Saturday evening the senior government

representative at the scene was notified of the Minister's proclamation under section 495 (c) of the Canada Shipping Act and he was then appointed on-scene commander. Although he had had no previous experience in a situation similar to this, Mr. Hornsby accepted his new responsibility and thereafter attempted to coordinate the many activities being pursued at the site. By Sunday the condition of the ARROW had deteriorated to the point where off-loading of its cargo was no longer possible and the stern section of the ship had to be broken from the bow in order to prevent further wreckage. Efforts during the next few days were directed towards the refloating of the stern section and taking it with its cargo to a safer place. These efforts were frustrated, however, on Thursday, February 12th by the sinking of the ARROW before the operation could be completed and all of their valiant efforts to minimize further pollution from the cargo remaining in the ship ended in disappointment. The problem had now become one of dealing with the oil remaining in the wreck at the bottom of the Bay and the cleaning up of the oil on the water and on the shores.

By Saturday, February 14th, some progress was being achieved towards the development of a plan for the removal of the contents of the wreck after Captain Madsen had arrived from New York. As this and other plans for the containment and clean up of the oil were progressing, the Government realized that the immensity of this pollution incident required the assignment of extensive forces with adequate financial resources to attack the job, and the Task Force was appointed and took over on February 21st, 1970.

The Commission does not wish to criticize the efforts of anyone involved in the aftermath of the ARROW's grounding but it must be pointed out that none of the persons associated with the attempts to prevent or minimize this

pollution had had any previous experience with a major pollution incident. Had these people had available to them an expert in tanker salvage working under the authority of an on-scene commander who had the immediate right to control the destiny of the ship, their efforts to minimize pollution might have been more successful.

The Task Force took over the clean up operation on a more highly organized basis. They carried on with much of the work that had been started earlier but with their greater scientific and technical resources were able to improve substantially on the clean up and anti-pollution techniques employed. Substantial quantities of oil were removed from the wreck by following the method originally proposed by Captain Madsen and techniques of removing oil from the water surface with slick-lickers were greatly improved. Much more effective booming arrangements were developed to protect the fish plants and dams were constructed to prevent further pollution. Different methods of cleaning the beaches were attempted and disposal of the oil recovered in dump sites arranged.

The systematic and scientific analysis of the various problems encountered has provided extensive knowledge upon which to base future plans and the research of the scientific coordination team has already and will in the future provide the basis for the development of oil spill clean up technology to be incorporated in a contingency plan to handle future catastrophes.

Fortunately for Canadians, the ARROW oil spill did not cause any substantial damage to the marine environment. It did not interfere with the fishery or the production of the fish plants in the area and the only damage to marine life was found in the intertidal zone. Although the clam beds were closed they were not operating commercially and the damage

there was due to suffocation rather than poisoning. The minimal damage done was due to a great extent to the nature of the cargo which could have been extremely toxic had it been composed of the lighter fractions of petroleum.

The problem of blackened shore lines and fouled boats and gear still remains for the residents of Chedabucto Bay as no amount of cleaning could have removed the general evidence of the disaster. How long this will remain is the subject of speculation as insufficient scientific investigation has been conducted over the years in this field. Until the remaining Bunker "C" is removed naturally by the process of biodegradation, evidence of the grounding of the ARROW will be kept in the minds of those who encounter the shores of Chedabucto Bay.

Since the ARROW incident, Canada and many other countries of the world have realized the tremendous potential damage that can be caused by a future oil spill. Efforts to prepare for such a contingency are at last being made. This country has moved ahead with legislative and physical planning and the international picture has improved as well. The Arctic Bill was the first step in the right direction. It has been followed by the recent amendments to the Canada Shipping Act passed in the House of Commons, which will put this country in a position where it can provide for improvements in navigation and construction of ships with a view to minimizing the possibility of pollution incidents and provide funds for compensation of those injured when such incidents do occur. A contingency plan has been developed within the Federal Civil Service under which an immediate and knowledgeable attack can be made on the problems created by any such future spill.

Internationally, an attempt has been made to give coastal states the right to prevent anticipated pollution

and to provide a means for paying for the damages suffered. The International Convention on Civil Liability for Oil Pollution Damage signed at Brussels, November 29, 1969, recognized for the first time the liability of the owner of a ship for pollution damage and limited that liability to two thousand francs per ton or an aggregate of 210 million francs. The limitation is not available if the damage occurred as the result of the actual fault or privity of the owner. In order to avail himself of the limitation of liability, the owner is required to constitute a fund in one of the contracting countries that would be able to respond to a judgment obtained in any other country.

At the same time the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties was signed at Brussels. This Convention permits parties to the Convention to take such measures on the High Seas as would be necessary to prevent, mitigate or eliminate grave and imminent danger to their coast line or related interests from pollution or threat of pollution of the sea by oil, following upon a marine casualty. These two Conventions represent the first major breakthrough in the ancient battle between those states that operate a large merchant marine and those states which are merely the victims of such operations. The two Conventions were not, however, satisfactory to Canada as they did not go far enough for the protection of countries such as ours with extensive coastal waters. They have not received acceptance in other member states and it would appear that all countries concerned are waiting for the 1971 Conference to find an acceptable solution which will adequately balance the needs of all countries in the oil pollution field.

The fact that Canada is making a real effort to spur on the work of IMCO in the formulation of a satis--

factory convention, is proceeding with changes in its own maritime legislation, is conducting continued research into the effect of and control of oil spills, is revising the regulations governing the construction and navigation of tankers, and has established a Federal contingency plan to be put into operation in the event of future spills, has been a direct result of the grounding of the ARROW in Chedabucto Bay on February 4th, 1970 and the pollution that followed. No previous event had been of sufficient impact to put these forces in motion.

CHAPTER 19

RECOMMENDATIONS

The first attack against the problem of pollution must be in the field of prevention, and the framework for the establishment of new navigational controls and requirements in ships' construction and equipment has been laid in the amendments to the Canada Shipping Act recently passed.

Navigation was once left to the skills and whims of the Master, but this doctrine can no longer apply. As the world tonnage grows and is becoming represented by larger and larger units, many restrictions on the ships' freedom of movement are becoming apparent. The draft alone of the supertankers limits their area of movement to well charted avenues of the required depth. The volume of traffic and the need to avoid collision and grounding in the cluttered sea lanes has demanded the development of traffic separation and navigation systems necessary for its control. It is interesting to note that only recently the barriers raised against the acceptance of traffic separation have collapsed and international agreement has been reached in this direction. The increase in the potential hazard created by such large quantities of oil in supertankers is the other factor that has demanded the development of the navigational systems. We can no longer afford a major oil spill and ways must be found to cover the costs of more sophisticated means of prevention if the hazard is to be avoided in the future.

Ships today are usually small parts of large transportation systems participating in the movement of goods throughout the world. To be competitive their movements must not be unduly impeded and any navigational

system which enhances their ability to approach a port and leave again with maximum speed and safety should be welcomed by the international shipping community. There is no reason why the ship or equipment required for this purpose should not be provided and properly maintained by the operators.

The approach system which has been devised for Chedabucto Bay with its traffic separation and the use of Loran, Decca and radar-equipped buoys appears to be a sound arrangement for the guidance of the supertankers expected to visit that area in the future. There are two radar stations connected with it which will enable the buoyage system to be monitored at all times and will enable ships' positions to be fixed from shore base as well. The system as described to the Commission, however, did not indicate that any shore based control or even ship-to-shore communication was envisaged in the scheme. It seems to the Commission that the only sure way to prevent the type of mistakes that occur from time to time when navigation is entrusted solely to the bridge of a ship is to have an independent check or control on that ship's movements. There should, in the opinion of the Commission, be a radar monitoring system covering the ships in the Bay and shore-to-ship communication to advise the Captain or pilot of his position and apparent hazards to be encountered.

Since the larger tankers normally are making deliveries to and from refineries, this type of navigational control system would only be required in areas of such concentrated traffic. Other tankers plying the coastal trade should be equipped to participate in the systems as well because of their greater need for accurate navigation arising out of their proximity to our coasts and their many visits to coastal ports in the course of their voyage.



RECOMMENDATION - Your Commission recommends that navigational systems be established at all major harbours and in all areas where oil refineries will be receiving and delivering oil by sea in which use will be made of Loran, Decca, radar, RDF, usual navigational aids and shore based radar surveillance with shore-to-ship communication of the ship's position and apparent potential hazards, and that all ships coming into Canadian coastal waters be required to maintain equipment necessary for participation in this type of system.

Evidence was presented to the Commission relating to the developments in the field of oil tanker construction. It is apparent that up until now little consideration has been given by the owners and designers of tankers to the incorporation of measures which would assist in the prevention of pollution. In the opinion of those who testified, any developments in this field would have to be forced by government regulations, and would not be sponsored by owners or operators of tankers unless they could show a positive economic advantage.

Some of the suggestions made dealt with double hull construction and it was thought that this might be a means of minimizing pollution after a grounding. Other suggestions dealt with the use of flexible piping within the ship so that a distortion of the hull would not necessarily put the pumping capacity of the tanker out of commission, and off-loading operations could be conducted.

Another suggestion to assist in the off-loading of a tanker's cargo was the installation of valves at the top of each tank, so that whole tanks could be pumped into a receiving ship by letting sea water into the bottom of the tank and forcing the oil to the surface. Such an arrangement to be

effective would require the use of a portable pump to be placed on the deck and a gas turbine type was recommended.

No detailed investigation of these suggestions was made and only one recommendation can be made arising out of the evidence that is before the Commission.

RECOMMENDATION - It is recommended that fittings be required on the deck surface of each tank in a tanker to which portable pumps can be attached for off-loading purposes in the event of an emergency. It is further recommended that continuing research be conducted into the design and construction of tankers so as to render them less liable to cause pollution in the event of a grounding or collision.

Inspection of ships is now carried out by the classification societies. These inspections are designed to assure that the ships conform with the existing international conventions and the requirements of their insurers. Little attention is paid to the condition of a ship's navigational equipment or the qualification of its personnel when these surveys are conducted.

Furthermore, there is no international standard set or required dealing with pollution control.

The standards to which oil tankers must be constructed and maintained in the future must be determined by regulation until such time as those standards are adopted by international treaty. To insure that ships being directed to this country meet these standards, some arrangement must be made for their inspection. Once the standards are determined there is no reason why an arrangement cannot be made with the various classification societies to act as agent for Canada and grant certificates of compliance on our behalf. To attempt to maintain a separate inspection staff and call it

into action whenever a particular ship wishes to come into Canadian waters isn't practical, and the shipping interests of the world are accustomed to using the classification societies for this purpose.

RECOMMENDATION - The Commission recommends that whenever construction and equipment standards are established for all tankers entering Canadian waters, an arrangement be made with the various classification societies to act as agent of our Government for the purposes of carrying out the necessary inspection and granting of certificates of compliance with our Regulations.

When a shipping casualty does occur there must be immediate notification given to Canadian authorities. In the case of the ARROW several hours passed before the Master notified Canso radio that he was grounded and then many more hours passed before he advised of any need for assistance. These are the crucial hours during a pollution incident and perhaps the only time when some successful avoiding action can be taken. Section 737 of the amended Canada Shipping Act makes provision for the passage of regulations setting forth circumstances in which the Master of a ship must report that he is in danger of discharging a pollutant, but until those regulations are made the ground rules will not be known. It is important that the decision as to whether or not there is a potential hazard should not be left to the Master of the ship who may very well tend to minimize his predicament rather than face reality.

RECOMMENDATION - Your Commission recommends that the regulations to be made under the amended Canada Shipping Act be phrased in such a way as to require the Master of a tanker to make immediate report to the pollution prevention officer as soon as any event has occurred which creates a possibility of the discharge of oil into the sea rather than a probability.

A contingency plan to meet the inevitable spills that will occur in the future is an absolute necessity. Such a plan requires the immediate availability of a small team of experts who can be rushed to the scene of any pollution incident and make an assessment of what has to be done to minimize or abate the threat. This team will have to have available to it expert knowledge in how to best deal with marine casualties from the pollution point of view as well as top scientific advice concerning the procedures it adopts. The team will have to have clear cut authority to act without hesitation caused by legal or financial concern, and there must be no question that the paramount consideration when formulating its plan of attack will be the prevention of pollution.

The team must have available to it a package of the type of supplies and equipment known in advance to be most suitable for such an operation. Such packages must be maintained in strategic locations so that they may be taken to the scene of a pollution incident by helicopter and put into immediate use. These packages should provide, when necessary, suitable portable pumps and fittings to assist in an off-loading operation. They must also provide properly designed booms for containment of oil spills, and slick-lickers for removal of the oil from the water. Dispersants of known quality must be available where they are

suitable to be used.

The team must be backed up by a well coordinated effort involving the military, technical and scientific forces of the government service who can bring into action the degree of support required for any containment operation. A regular liaison with the oil industry should also be maintained and their organization should be used to complement the work of the team. A proper contingency plan must be supported by continued scientific research into the technology of oil spill containment and with the rapid movement in this field today, will require regular updating of its procedures.

The Interim Federal Contingency Plan for combatting oil and toxic material spills, issued in July 1970 shows that the Federal authorities are moving in this direction. It is an excellent start on a suitable contingency plan and envisages the eventual establishment of a truly comprehensive national contingency plan through cooperation between the Federal, Provincial and Local levels of government.

Before the amendments to the Canada Shipping Act are proclaimed, it will be necessary to tie in the contingency plan with the role of the pollution prevention officer, so that there will not be two persons exercising authority at the same time.

RECOMMENDATION - Your Commission recommends that efforts be continued to establish a truly national contingency plan for combatting oil and toxic material spills so as to provide for immediate assessment of any threatened oil pollution incident and the taking of whatever action is necessary for the containment and clean up of the spill should it occur. Such plan to provide for full cooperation between Federal, Provincial and Municipal governments, members of the oil industry and the United States Government, our neighbours to the South. The plan must be tied in with the recent amendments to the Canada Shipping Act and other legislation dealing with pollution and must provide not only for a team of qualified persons to act immediately, but also for the mustering of substantial forces to combat an incident and research into the effects of oil pollution and clean up technology.

The recent amendments to the Canada Shipping Act call for the enforcement of the new anti-pollution regulations in Canadian waters within what is roughly described as a twelve-mile limit. The area corresponds to fishing zones of Canada prescribed pursuant to the Territorial Sea and Fishing Zones Act. No international agreement as yet permits coastal states to enforce anti-pollution regulations to the extent called for in the Canadian legislation and the Government is therefore obviously being very cautious in its approach. It is felt that other countries will recognize Canada's right to extend its jurisdiction in the manner attempted.

A twelve-mile limit is, however, unsatisfactory from the point of view of pollution control. As was

pointed out earlier, the oil from the ARROW drifted a hundred miles to pollute the shores of Sable Island and if satisfactory preventative steps are to be taken, the limit should be extended to the Continental Shelf. This would mean, of course, intruding into one of the major sea lanes of the world and could not be enforced by unilateral action of this country. An international agreement must be worked out.

RECOMMENDATION - Your Commission recommends that every effort be made to obtain international agreements which would give Canada jurisdiction to enforce its proposed anti-pollution legislation to a distance from its shores that would be adequate to prevent the fouling of its coastline.

The provisions of the amendment to the Canada Shipping Act which deal with financial responsibility for oil spills render both the owner of the ship and the owner of its cargo jointly and severally liable for the costs of clean up and damage caused by an oil spill. The principle of liability without fault has been adopted and a limitation of liability to the extent of two thousand gold francs (\$134.00) per ton or 210 million gold francs (\$14,000.00) in total has been permitted. The limitation does not apply in the event of fault or privity on the part of the owner. A Maritime Pollution Claims Fund will also be established by making a levy of up to 15 cents for every ton of oil transported through Canadian waters. This fund together with an insurance or bonding arrangement to cover the primary liability will be used to satisfy all claims for damage caused by an oil pollution incident and the costs expended in its clean up.

These provisions appear to have overcome the past difficulties standing in the way of recovery of damages suffered and costs incurred as a result of an oil

pollution incident and are, in the opinion of the Commission, much more satisfactory than reliance upon any voluntary scheme such as TOVALOP and CRISTAL. If a scheme such as this could be incorporated in the International Convention for the Pollution of the Sea by Oil, the costs of such a fund would be spread over a broader base and would not fall exclusively on tankers serving Canada.

RECOMMENDATION - Until such time as the principle of absolute liability, secured by a fund from which collection can readily be made, are established in an international agreement, civil liability provisions of the type contained in the amendments to the Canada Shipping Act should be enforced in this country against polluters of our coastal waters.

My final recommendation deals with research. Every one who became associated with the ARROW discovered the amazing lack of knowledge of the effects of oil pollution in the marine environment and of the ways of dealing with it. Much has been accomplished since that time through the efforts of the scientific people involved, but many questions still remain unanswered.

RECOMMENDATION - Your Commission recommends that continuing research be conducted into the effects of oil spilled into the marine environment and into the methods of dealing with it.

Perhaps some day a way will be found to remove the fear of a catastrophic oil spill along our shores. The ARROW was a relatively small tanker. Let us hope that its misfortune will have triggered sufficient activity to prevent a major spill in the future.

ALL OF WHICH IS RESPECTFULLY SUBMITTED:



Commissioner



1970  
CANADA

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.

R E P O R T

TO THE HONOURABLE DON JAMIESON, Minister of Transport,  
Ottawa, Canada.

On March 12, 1970, I received your appointment as 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 4th, 1970, and the subsequent sinking of the ship, the pollution arising therefrom and the measures taken to prevent or minimize

pollution damage.

On the same date by Order-in-Council P.C. 1970-448, His Excellency the Governor General in Council authorized my appointment as a Commissioner under the Inquiries Act to conduct an Inquiry 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 Minute of the meeting of the Privy Council is as follows:

"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 1 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. "

After considering my terms of reference in each of these appointments, I reached the conclusion that the Inquiry should be divided into two phases. The first phase would be conducted in the normal way of a formal investigation into a shipping casualty pursuant to the Canada Shipping Act and the Shipping Casualty Rules, and would inquire into all matters up to the time of the grounding of the S.S. ARROW. The second phase will deal with all matters arising subsequent to the grounding of the S.S. ARROW including the sinking of the vessel, the measures taken to prevent or minimize pollution damage and the actual pollution of Canadian waters by oil escaping from the S. S. ARROW, with a view to the prevention of such pollution damage in the future.

Once this division of the Inquiry was made, plans proceeded for the holding of the Formal Investigation into the circumstances surrounding the grounding of the Steam Tanker ARROW. Two Nautical Assessors were appointed to assist the Court in technical matters. They were Captain R. Caldwell and Mr. Murray Osborne, both of whom have had considerable tanker experience, the former as Master and the latter as a marine engineer. Mr. Vincent A. J. Morrison, O.C. of Sydney, Nova Scotia, was assigned to act as counsel to the Commission and Mr. K. Peter Richard of Antigonish was appointed to assist him. Arrangements were made to conduct hearings at the new Dalhousie Law School Building in the City of Halifax commencing May 25th, 1970 and due public notice was given in the national press of the time and place of the holding of the Formal Investigation.

The date for commencement of the hearings would have been earlier but Commission counsel felt it was necessary to have testimony from some member of the

crew of the S. S. ARROW, none of whom WAS subject to the laws of Canada. Eventually arrangements were made with the owners of the vessel to have its Master attend the hearings on a voluntary basis but his presence was unavailable until May 25th, 1970.

A Notice of Investigation including a statement of the case together with a statement of the questions to be raised at the hearing was served on the owners of the S. S. ARROW and Imperial Oil Limited, the owners of its cargo. The parties to the Formal Investigation therefore were:

The Minister of Transport  
Sunstone Marine Panama SA., the owners of the  
S.S. ARROW

Imperial Oil Limited, the owners of the cargo.

No other person applied to be added as a party at the hearings. All parties were represented by counsel and the Republic of Liberia was represented by Mr. Robert Vaughan.

Before the Investigation proceeded, Your Commissioner and both Nautical Assessors took and subscribed the oaths required by the Canada Shipping Act, which are attached hereto for your record.

Mr. Edgar Gold, a law student, studying at Dalhousie Law School, a former sea captain, acted very efficiently as Clerk of the Court. Miss Patricia Martin, who has had previous experience in the conduct of Formal Investigations into Shipping casualties, was appointed secretary to the Commission, and Dr. Gordon A. Riley, Ph.D. of the Dalhousie Institute of Oceanography, has been appointed scientific adviser, but his responsibilities will fall within the second phase of the Investigation.

The firm of Nethercut and Company Limited

of Toronto acted as official reporters during the Inquiry and produced satisfactory daily transcripts of the evidence as the hearings proceeded.

The hearings commenced on May 25th, 1970 and continued until June 2nd, 1970. Written briefs were submitted and oral argument completed on June 29th, 1970. Attached to this Report is a transcript of the evidence taken at the hearings, the oral arguments of counsel, the exhibits tendered in evidence and the written briefs submitted by counsel.

Attached also is the original statement of the case containing the questions submitted for the opinion of the Court. These questions have all been dealt with except number 16 which was deleted at the hearing by agreement since this question will be dealt with in the second phase of the Inquiry. Question number 7 was amended by agreement of counsel and the amended question is attached.

The findings of the Court are being handed down this date and a copy of these findings is attached to this Report. Copies are also being sent to the parties to the Formal Investigation.

I call your attention to certain recommendations contained in the judgment concerning certain Canadian Marine publications. I trust that appropriate action will be taken to implement these suggestions.

The second phase of the Inquiry is scheduled to open on September 8th at Province House, Halifax, Nova Scotia. These hearings will be publicized in the national press.

I return herewith my original appointment

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and that of the Nautical Assessors, as I believe that my responsibilities pursuant to Section 558 of the Canada Shipping Act have now been fulfilled.

DATED at Halifax, Nova Scotia, this  
day of July, A.D. 1970.

RESPECTFULLY SUBMITTED:



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Gordon L. S. Hart  
Commissioner

1970  
CANADA

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 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,

-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,

and

Captain Arthur Reginald Caldwell, Nautical Assessor,  
Murray R. Osborne, Nautical Assessor.

J U D G M E N T

On February 4th, 1970, at approximately 0935, Atlantic Standard Time, the Steam Tanker ARROW ran aground on Cerberus Rock in Chedabucto Bay, Nova Scotia, within the internal waters of Canada. The ship subsequently broke in two and large quantities of her cargo of Bunker C fuel oil escaped from her tanks causing extensive pollution to Canadian waters and the shores of

Chedabucto Bay.

On March 12th, 1970, the Honourable Don Jamieson, Minister of Transport, pursuant to Section 558 of the Canada Shipping Act, Chapter 29 of the Revised Statutes of Canada, 1952, appointed me a Commissioner

"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 4th, 1970, and the subsequent sinking of the ship, the pollution arising therefrom and the measures taken to prevent or minimize pollution damage."

The extent of the oil pollution was so great that it was felt a more extensive inquiry than normally made under the Canada Shipping Act was necessary and a report was made to the Committee of the Privy Council of Canada as follows:

"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 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."

Pursuant to this Report, on March 12th, 1970, His Excellency the Governor General in Council by Order-in-Council P.C. 1970-448 authorized my appointment as a Commissioner pursuant to the provisions of the Inquiries Act, Chapter 154 of the Revised Statutes of Canada, 1952,

"to conduct an inquiry 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."

A formal investigation into a shipping casualty under the Canada Shipping Act must be conducted



in accordance with certain statutory procedures and rules; whereas under the Inquiries Act, a Commissioner is free to adopt whatever rules of procedure he deems appropriate. Under the Canada Shipping Act, the appointment of counsel and nautical assessors lies with the Minister, whereas under the Inquires Act the appointment of technical advisers, assistants and staff are vested in the Commissioner. Furthermore, the Commissioner is directed to report to the Minister under the Canada Shipping Act and to the Governor-in-Council under the Inquiries Act. It soon became apparent that it would be impractical to pursue my terms of reference in a single proceeding, and I therefore divided the inquiry into two phases. The first phase has been conducted as a Formal Investigation into the grounding of the ARROW under the Canada Shipping Act, and the second phase will deal with the sinking of the ship and subsequent pollution of Canadian waters by oil escaping therefrom. This division was approved by the representatives of the Minister of Transport and all reference to the pollution aspect of the Inquiry was deleted from the questions placed before the Court.

This judgment is therefore rendered after having conducted a Formal Investigation into the circumstances surrounding the grounding of the Steam Tanker ARROW on Cerberus Rock in Chedabucto Bay, Nova Scotia, on February 4th, 1970, in accordance with the Canada Shipping Act and the Shipping Casualty Rules made pursuant to Section 578 thereof. The court was assisted by Captain Arthur Reginald Caldwell and Mr. Murray R. Osborne sitting as Nautical Assessors, both of whom have concurred in this judgment.

The hearings commenced on May 25th, 1970, and continued until June 2nd, 1970. Written briefs were

submitted and oral argument was completed on June 29th, 1970. Counsel to the Commission were Vincent A. J. Morrison, Q.C., and K. P. Richard, Esq. Parties to the Inquiry were the Department of Transport represented by E. N. McKelvey, Q.C., and C. K. Kennedy, Esq.; Sunstone Marine SA of Panama, the owners of the S.T. ARROW represented by Peter R. D. MacKell, Q.C., D. A. Kerr, Q.C., M. J. Healy, Esq., and B. Clevin, Esq.; Imperial Oil Limited, the owners of the cargo represented by Donald McInnes, Q.C., John H. Dickey, Q.C., Flavel Barrett, Q. C. and J. E. Gould, Esq. The Government of Liberia was represented by Robert Vaughan, Esq.

After considering the evidence as a whole, and the arguments of counsel, the Court finds the factual situation to be as follows:

The Steam Tanker ARROW was built by Bethlehem Steel Company at Sparrow's Point, Maryland, U.S.A. in 1948. Her registered length was 529.4 feet and her registered gross tonnage was 11,379.37 tons, with a net tonnage of 6,897 tons. Her oil carrying capacity was divided among 27 tanks marked 1 to 9 starboard, centre and port. She was powered by a steam turbine engine generating 6,050 horsepower and driven by a single screw. Her registration called for a crew of 38 and she was assigned radio call and signal letters 5LHI.

At all times material to this Inquiry the S.S. ARROW was owned by Sunstone Marine SA of Panama and operated on its behalf by Olympic Maritime SA of Monte Carlo. Her permanent certificate of registry was issued by the Republic of Liberia dated October 18th, 1962. On July 6th, 1965 the owners of the ship 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) Com-

pany Limited entered into a Tanker Voyage Charter Party 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, including ports requiring transit of the St. Lawrence Seaway. Under this Tanker Voyage Charter Party the charterer was required to notify Standard Tankers of its requirements for petroleum carrying services and Standard Tankers would then assign a suitable ship for the voyage. Under both the Time and Voyage Charter Parties the responsibility for the condition, equipment and navigation of the ship remained with the owners, who were to "supply a full complement of Master, Officers and crew and maintain the ship in a tight, staunch and strong condition at all times."

Pursuant to the Time and Voyage Charter Parties, from November 1st, 1965 until December 4th, 1969, as a result of requests from Imperial Oil Limited, the S.S. ARROW made fifteen voyages from loading ports such as Amuay Bay, Venezuela; Aruba, Netherlands Antilles; Rotterdam, Texas City and Carapito to such ports of discharge as Montreal, Toronto, Quebec, Port Colbourne, Port Hawkesbury, Chatham and Charlottetown in Canada. It was during the last voyage under this arrangement that the S.S. ARROW was loaded at Amuay Bay, Venezuela and while proceeding to Port Hawkesbury as its port of destination, was grounded on Cerberus Rock in Chedabucto Bay and sank.

Captain George Anastassopoulos was the Master of S.S. ARROW at the time of her grounding. He is a Greek National and has had eighteen years of experience in all officer ranks at sea. He holds a Master's certificate ALPHA for sea-going vessels issued by the Department of Merchant Marine of Greece. He also holds

a Master's certificate foreign-going issued by the Republic of Liberia. Although his natural tongue is Greek the Captain does have some facility for reading and speaking English, but it is apparent that his ability is quite limited. The officers and members of the crew of the ARROW were at the time, with one exception, Greek Nationals and although none were called to testify at the Inquiry, I would presume that the working language for the S.S. ARROW was Greek. The ship's log was however written in English as were the British and American charts and navigational publications carried on board and the Captain's limited knowledge of English was not in the opinion of the Court a factor which in any way contributed to the shipping casualty.

Captain Anastassopoulos joined the S.S. ARROW at Charlottetown on December 11, 1969. He sailed to Chatham, New Brunswick, where on December 14th, 1969 he assumed command of the ship.

At this time the S.S. ARROW carried a complete set of British and American charts and navigation publications. No such Canadian charts and publications were carried aboard and the Captain says that he was satisfied that the British and American publications were satisfactory for his purposes. There was one Canadian publication dealing with the lights in inland waters and the Great Lakes, but none dealing with the Atlantic coast.

When Captain Anastassopoulos assumed command of the ARROW she was equipped with magnetic compasses, a Sperry-gyro compass with repeaters, a mechanical sounding device, a hand lead, a Raytheon radar, a radio-direction finder, and an echo sounder, which did not work. At no time during the Captain's term as Master of the S. S. ARROW did the echo sounder work.

After taking command, Captain Anastassopoulos

sailed the S.S. ARROW from Chatham to Aruba, arriving there on December 22nd. After loading her tanks she left Aruba for Salem, Massachusetts, on December 24th. During this voyage, the motor of her gyro compass failed and from February 26th at 0250 until 1300 the ship was steered by magnetic compass. From December 27th to December 31st, while completing the voyage to Salem the S.S. ARROW encountered very rough weather with very high seas. The rolling and pitching of the ship was so great that speed was reduced to prevent damage. Heavy waves were breaking with force on the main deck and superstructure and the hatch coaming of number 7 port cargo tank was bent, and pipes of the heating coils on deck were broken. Sea water appeared in the boiler water, which was presumed to be coming from the broken heating coils on deck and to avoid any boiler damage it was decided to shut off the heating coils. On December 28th cargo oil had appeared on the deck and it was discovered that oil was leaking from the hatch coaming of cargo tank number 7 port, and temporary repairs to this hatch coaming were made.

While discharging cargo at Salem, oil appeared outside of the number 6 starboard tank from below the water level around a rivet and according to the log the cargo in number 7 port wing tank had been contaminated with sea water. After samples were checked this cargo was refused by the Charterers.

On January 1st, 1970, the S. S. ARROW was ordered to proceed to New York and the following day the gyro compass once again was not working properly, and the ship was steered by magnetic compass.

The S. S. ARROW left New York on January 6th for Aruba and because of poor visibility at the beginning of the sea voyage it was necessary to use radar.

Very rough weather was encountered and the log shows that on January 9th the gyro compass was off once again. On January 11th the gyro compass was restored to service and Captain Anastassopoulos explained that the trouble with the gyro compass was in the motor. The first time it stopped after he took command of the ship it was repaired by the replacement of the brushes, but on the second occasion no part was immediately available and the period of repair lasted several days. The Captain further testified that the gyro compass when working was maintaining a constant error of three degrees West when it was checked at noon of each day.

On January 14th the S. S. ARROW arrived at Aruba, discharged her cargo and proceeded to Oranjestad for repairs, which were commenced on the 19th. Repairs were completed on the 25th and on January 29th, 1970, a certificate was issued by the American Bureau of Shipping at Aruba, maintaining the class of the S.S. ARROW as +A1 (e) oil carrier, the highest rating given to tankers by the American Bureau of Shipping. During this period of repair Captain Anastassopoulos says that he also had the radar set checked as he had had some trouble with its operation prior to that time.

With the repairs completed the S. S. ARROW left Oranjestad on January 26th and proceeded to Amuay Bay, Venezuela, where she arrived the following day. On January 28th, 1970, she completed the loading of her cargo of 16,010 tons of Bunker C fuel oil and 79.5 tons of a lighter grade fuel. The Bunker C fuel oil was distributed among all of the ship's tanks except number 5. The 79.5 tons of lighter fuel were carried in number 5 centre tank and number 5 starboard and port wing tanks were left empty. It was with this cargo that the S.S. ARROW set sail for Port Hawkesbury on January 28th, 1970.

The voyage was apparently uneventful and the S. S. ARROW was averaging between 13 and 14 knots in the open sea. The Captain indicated that the gyro compass continued to have a constant error of 3 degrees West and that he had no need to use radar during the voyage. Landfall was made on the Nova Scotia coast prior to 0800 on February 4th, 1970, while the Second Mate was in charge of the watch.

At 0800 Captain Anastassopoulos took charge of the ship and remained in full charge thereof until her grounding at 0935. The Third Mate was on duty with the Captain on the bridge during this last watch and he also had the assistance of a lookout, a seaman by the name of Boukalis. The Third Officer had attended a nautical school but was not licensed at the time. The only other person on the bridge was the helmsman.

According to Captain Anastassopoulos, at 0810 he established the position of the S. S. ARROW in relation to Cranberry Island Light by means of radar and had the position checked by his officer of the watch visually. Again at 0815 he fixed the ship's position as being abeam of Cranberry Island Light and distant 3.5 miles from it. This position was also taken by radar and verified visually both by the Captain and the Officer of the watch. The visual verification was taken by a compass bearing. Captain Anastassopoulos continued the ship on its course of 012° True and took another position at 0825 when he was abeam Grime Shoal spar buoy at a distance of one half mile. Although this buoy was marked in the log as an unnamed buoy, it was observed by the Captain to be a spar buoy and accepted by him as the Grime Shoal gas and whistle buoy shown on the charts that he was using. The Captain said that he further checked his position by reference back to the Cranberry Island Light.

From this last position the Captain calculated the time period of five minutes to permit the S. S. ARROW to travel one mile through the water and planned an alteration of course at 0830 to 291° True which would carry the ship into Chedabucto Bay safely past Cerberus Rock, the only navigational hazard, and into the area where he was to pick up the pilot. The plotted course into Chedabucto Bay was a little over a mile off Cerberus Rock buoy when there was an area of six miles of safe water through which the ship could pass, but the Captain indicated that he wished to be close enough to the buoy to identify it at the proper time.

After laying off the course of 291° True, Captain Anastassopoulos said that he made provision for the three degree Westerly error in his gyro compass and allowed one degree to compensate for his anticipated set by wind and tide and established a gyro course to be steered of 293° degrees. He then gave the command for change of course at the time planned and continued at full revolutions into Chedabucto Bay. The Captain calculated that his sea passage would end at 0912 and at this time reduced from full speed revolutions of 95 to 80 revs; and at 0925 gave an order for further reduction to 60 revolutions. These reductions of speed came only shortly before the ship's grounding and measurement on the chart from the ship's position at 0830 to the time of grounding indicates that the ship made an average speed of 12.6 knots over the ground.

As the S.S. ARROW proceeded into Chedabucto Bay, the winds were from the south at force 7 to 8 on the Beaufort scale. This placed the force of the wind on the port beam of the ship. Waves were 3 to 4 feet and the tide was about half ebb. The weather was overcast with mist and spray.

The question of visibility that morning is



one in which the Captain of the S.S. ARROW finds himself in conflict with many other witnesses. He says that the visibility was between three and four miles at eight o'clock when he took over the watch but that by nine it was cloudy and foggy and had closed in. Captain Anastassopoulos claims that the visibility had closed to less than a mile at the time of the grounding, and he was unable to see any of the land based aids to navigation shown on his charts and was therefore unable to verify his position from any visual bearings.

Other witnesses located in different areas in and around Chedabucto Bay at the time testified that the visibility was much greater. Mr. Gerrior, who was in charge of the Canso Radio station and had a responsibility to take measurements at fixed times, placed the visibility between eight and nine a.m. at approximately eight miles. He says that it was reduced to two miles between ten and eleven a.m. that morning. Mr. LeBlanc, who tended the lighthouse at Creighton Island, placed the visibility at six miles shortly after the grounding. Captain Mersey of the fishing trawler J. B. NICKERSON observed the S. S. ARROW as she came in Chedabucto Bay and had her within visual sight until after the time of her grounding: he says that he could see her clearly when his radar indicated that she was almost six miles away.

Having considered all the evidence concerning visibility, the Court is satisfied that at all times prior to the grounding of the S.S. ARROW, the Captain of that ship was operating under conditions of visibility of between five and six miles. The Court cannot therefore accept the evidence of Captain Anastassopoulos to the effect that he was unable to obtain visual fixes of his position subsequent to his last alteration of course from land based

aids to navigation.

The Captain said that after he made the 0830 alteration of course, he felt that he had been working from a good position and did not anticipate any difficulty. He did attempt to fix his position by a few radar bearings but the radar set did not function properly and he was unable to do so. He says that the radar was sectoring and producing spurious blips on which he could not rely and that this was the same trouble that he had experienced on an earlier voyage and had supposedly been repaired at Oranjestad two weeks before.

When the difficulty with the radar developed and he was unable to fix his position in this manner, instead of attempting visual fixes he relied upon the ability of his Second Mate, the lookout and himself to sight the Cerberus Rock buoy to verify his end of voyage position. He was, however, so confident in the correctness of his course that all efforts were made to sight the buoy on the starboard bow of the S.S. ARROW and very little reduction in speed of the ship was made. The unfortunate truth of the situation was, however, that instead of making good a course of 291° True from the charted point of the last compass course change, the S.S. ARROW made good a course of 297° True and landed squarely on top of Cerberus Rock. The course made good took the ARROW a mile and a half north of her plotted course and this was one half mile north of the Cerberus Rock buoy.

Although there is some suggestion in the evidence that a lookout was being kept on the port bow as well, the Court is satisfied that any lookout that was in fact being kept was directed towards the starboard side of the ship. The argument raised by the owners to the effect that Captain Anastassopoulos was misled by the change of the normal summer gas and whistle buoy on

Cerberus Rock, to a winter spar buoy, which could not be seen as well by a navigator, is not acceptable to the Court. Under these circumstances the difference between the two different types of buoy used to mark the hazard of Cerberus Rock was not a material factor which contributed to the failure of the Captain and his crew to sight the buoy. They were looking where they expected to see it, not where it was.

The Steam Tanker ARROW grounded on Cerberus Rock on February 4th, 1970, because her Captain who was in charge of her conduct at the time failed to see that she made good the course plotted for her entry into Chedabucto Bay. The fact that she did not make good this course was probably caused by a combination of his failure to see that the alteration of course scheduled for 0830 was made accurately at the time and at the position chosen on the chart; and by the fact that insufficient allowance was made for the action of the wind and tide in setting a course of 293° to be steered during the hour-long passage. Gross negligence, however, was attributable to Captain Anastassopoulos when he found that he was unable to confirm his plotted course by radar and failed to confirm it by use of the visual aids to navigation that were available to him at the time. Had he determined his position at any time within an hour after his original change of course he would have had ample opportunity to avoid the grounding by passing to either side of the Rock, but instead he relied upon the accuracy of his 0825 fix and was confident that he was making good the course laid out on the chart.

There was some suggestion that all of the Captain's calculations were made by the use of Chart HO-611, a small-scale American chart of Cape Breton Island and Cabot Strait, and that Chart HO-1236 showing the details of the Strait of Canso and Chedabucto Bay was not on board the ARROW at the time. The Court accepts the evidence

that U.S. Chart HO-1236 was being used by Captain Anastassopoulos as well as HO-611 in plotting the course for the ARROW to take into Chedabucto Bay, even though there is some difference in the position lines placed on the two charts. Even if this were not so, however, and only one of these charts had been used it would not have contributed to the grounding of the S. S. ARROW. The course laid off for the entry into Chedabucto Bay of 291° True is a course which would have taken the ARROW safely by Cerberus Rock had the ship been navigated in such a manner as to make good the course plotted.

There was also some suggestion at the hearing that the ARROW should have had on board all of the latest Canadian charts and publications concerning aids to navigation. It is the view of the Court that the grounding was not caused or contributed to by the failure of the ARROW to carry on board such charts and publications. The ARROW was a ship which plied the waters of the world and carried with her complete sets of American and British charts and publications. This practice is recognized in marine circles throughout the world because it would be in fact impossible for ships to carry the national marine publications of every country, and keep them up to date and ready for use should the ship be sent to a particular country. Undoubtedly the Canadian charts and publications give the best and most up to date information concerning Canadian waters and should be used by those navigators who enter Canadian waters frequently, but it cannot be said that a mariner is negligent for not doing so.

One of the main reasons given by counsel for the Minister for the argument that Canadian publications should have been aboard the ARROW was that her Master would have been familiar with the change in the Cerberus Rock buoy

from the summer gas and whistle buoy to a winter spar buoy. The carrying of Canadian publications would not, however, have given the Captain information which was much different than that contained in the British publications on the subject. The only way the lifting of the summer buoys and replacement with winter spar buoys could have been brought home to the Captain was through the reading of Canadian Notices to Mariners setting forth the change in the buoy or by listening to the radio Notices to Shipping issued over Canadian marine radio stations advising of the change. Since the Court is of the opinion that the changing of the Cerberus Rock buoy to a winter spar buoy had no bearing on the grounding of the ARROW, it cannot be said that the carrying of Canadian charts and publications or the monitoring of Canadian marine radio broadcasts by the ARROW would have prevented this disaster.

We must in no way, however, give the impression that the Court in any way underestimates the value of Canadian charts and publications to those who sail regularly into Canadian waters. Since both British and American authorities select their material concerning navigation in Canadian waters from Canadian sources, their importance becomes equally as great to those foreign-going ships using British and American charts and publications. There is, however, a gap to be filled to cover any changes in navigational aids listed in Canadian or British or American publications carried on foreign-going vessels between the time of their last updating and the time of the arrival of these ships in Canadian waters. The evidence adduced at this Inquiry leads to two suggestions that are made in order to bridge this gap.

The first suggestion is that the references to the removal of summer buoys and the replacement by winter spars in the various Canadian publications be more

accurately set forth. The evidence reveals a difference between the reasons given by the Department for the removal and replacement of the buoys from the reasons stated in the various publications, and it might well be that a navigator would interpret these instructions to mean that the regular buoys would only be moved during periods of drift ice flow in the area. If this change should be made some attempt should be made to have the British publication corrected as well since the same impression is left there.

The second suggestion is that some alteration should be made in the publication of Notices to Mariners and the shipping notices by radio telephony and wireless telepathy to insure that notice of changes in navigational aids is available to foreign-going ships approaching Canadian waters and coming within range of the radio broadcasts after the radio Notices to Shipping have been cancelled but before the foreign-going vessels have had an opportunity to receive the written Notices to Mariners.

In this case the failure of the ARROW to receive notice of change of the Cerberus Rock buoy was not a contributing factor to the casualty, but in other cases it is possible that it could be. With the possibility of such extensive damage being caused by marine disasters of this nature in the future, this Court recommends that the Department make every effort to close this gap in their excellent system for dissemination of the latest navigational information.

The answers to the questions that have been placed before this Inquiry are as follows:

1. (a) By whom was the S.S. ARROW owned and operated at the time of her grounding on February 4th, 1970?

**ANSWER:** The S. S. ARROW was owned by Sunstone Marine Panama SA, and was operated on behalf of the owner by Olympic Maritime SA of Monte Carlo at the time of her grounding on February 4th, 1970.

(b) Was any person other than the owner responsible for the manning, equipping and supplying of the S. S. ARROW?

**ANSWER:** Other than the owner, Olympic Maritime SA of Monte Carlo which managed the operation of the S. S. ARROW would be responsible for the manning, equipping and supplying of the S.S. ARROW at the time of her grounding on February 4th, 1970.

2. By whom, where and when was the S.S. ARROW built?

**ANSWER:** The S. S. ARROW was built by Bethlehem Sparrows Point Shipyard Inc. at Maryland, U.S.A. in 1948.

3. What are the particulars of the S. S. ARROW as described on her certificate of registry?

**ANSWER:** The particulars of the S. S. ARROW as shown on her permanent certificate of Registry No. 99-62 of the Republic of Liberia, dated October 18th, 1962, are as follows: steel single screw steam turbine tanker, official number 961; radio call and signal letters 5LHI. Registered length, 529.4 feet. Registered breadth, 63.3 feet. Registered depth, 37.5 feet. Gross tonnage, 11,379.37 tons. Net tonnage, 6,897 tons. Horsepower, 6,050 S.H.P. Crew, 38.

4. (a) By whom, where and when was the S. S. ARROW last surveyed?

**ANSWER:** The S. S. ARROW was last surveyed by Allan L. O'Brien,

a surveyor with the American Bureau of Shipping, as agent for the Republic of Liberia, commencing January 19th, 1970, and being completed January 29th, 1970, at Aruba, Netherlands Antilles.

(b) What was the result of that survey?

**ANSWER:** The surveyor recommended that the classification of the vessel with the American Bureau of Shipping as +A1 (E) oil carrier be retained. This classification is the highest classification for tankers issued by the American Bureau of Shipping.

5. Was the S.S. ARROW in possession of all the required certificates of a safety convention ship, and were these certificates valid?

**ANSWER:** The S. S. ARROW was in possession of all the certificates required of a safety convention ship by the International Convention for Safety of Life at Sea, 1960, and these certificates which were valid are as follows:

(1) Cargo Ship Safety Construction Certificate, Republic of Liberia, issued at New York on April 10, 1967 and valid until February 28th, 1972, by the American Bureau of Shipping.

(2) Cargo Ship Safety Equipment Certificate, Republic of Liberia, issued at Genoa, Italy on April 20, 1968, and valid until April 20, 1970, by the American Bureau of Shipping. In addition, the S. S. ARROW had undergone a safety equipment inspection at Aruba, N.A. from January 19th, 1970 to January 29th, 1970, and as a result, the American Bureau of Shipping had recommended the issuance of a new Cargo Ship Safety Equipment certificate.

(3) Cargo Ship Safety Radio Telegraphy Certi-



ificate, Republic of Liberia, issued at Aruba, N.A. on April 30th, 1969 and valid until April 30th, 1970, by the American Bureau of Shipping. In addition, the S. S. ARROW had undergone a radio telegraphy installation inspection at Aruba, N.A. January 19th, 1970 to January 29th, 1970, as a result of which the American Bureau of Shipping had issued a new Cargo Ship Safety Radio Telegraphy certificate valid from January 29th, 1970 to June 29th, 1970, pending issuance of final certificate.

In addition to the three certificates issued under the International Convention for Safety of Life at Sea, 1960, the S. S. ARROW was also in possession of a valid International Load Line certificate (1966). This certificate was issued under the authority of the Republic of Liberia by the American Bureau of Shipping at New York on May 26th, 1969, and was valid until February 9th, 1972, subject to periodical inspection in accordance with Article 14 (1) (c) of the Convention. Although the International Convention on Load Lines (1966) has been accepted by Canada, the effective date was April 14th, 1970 and at the time of the grounding of the S. S. ARROW Canada was still bound by the provisions of the International Load Line Convention of 1930. The S. S. ARROW was, however, in possession of the certificates required under the International Load Line Convention 1930 issued by the American Bureau of Shipping, at Aruba, N.A., on April 30th, 1969.

6. (a) With what navigational aids was the S. S. ARROW provided?

**ANSWER:** The S. S. ARROW was equipped with the following navigational aids: magnetic compass, gyro compass, radar, radio direction finder, echo sounder (sonic fathometer), mechanical depth sounder, hand lead and sextant.

(b) Were these navigational aids in efficient working order at the time of her grounding?

**ANSWER:** Magnetic Compass: the Master of the ARROW testified that the magnetic compass was working satisfactorily but there was no evidence as to when this compass was last swung or corrected or subsequently verified by azimuth.

Gyro Compass: the ARROW was equipped with a Sperry gyro compass and repeaters. The evidence indicated that there had been difficulty with the brushes in the motor of the gyro compass on October 22nd, 1969, December 26th, 1969, January 2nd, 1970 and January 9th, 1970. But the Captain testified that the gyro compass was checked daily and showed a constant error of three degrees W. By checking the relationship between the gyro heading and the standard compass heading at noon positions on January 30th, 31st, February 2nd, 3rd and 4th, and making allowance for a constant gyro error of 3° High and for the magnetic compass variation at these positions, a deviation of from 9 to 11 1/2° is observed. If the gyro compass was functioning with a constant 3°W error, then this fluctuation of 2 and 1/2° is totally attributable to the magnetic compass, but since there is no evidence confirming the accuracy of the standard compass it can only be said that one or the other of the gyro and standard compasses was not rendering a true and constant indication of direction.

The evidence was that the Captain navigated by gyro compass alone and that he did in fact complete his ocean voyage at the position contemplated. This fact to some extent tips the scale in favour of the accuracy of the gyro compass, and the Court cannot say that it was not functioning with a constant error on the day of the grounding.

Radar: the ARROW was equipped with a Raytheon radar set which had been checked during the period of repairs at Aruba as a result of difficulties encountered by the Captain during an earlier voyage. Captain Anastassopoulos described how the radar developed a similar malfunction after he had altered course into Chedabucto Bay. He described what is known as sectoring or spoking on the radar screen which made it very difficult for him to determine what was being shown by the set. Pie-shaped black sectors would revolve on the screen which interfered to such an extent with the picture shown as to render it impossible to place any reliance upon the information being revealed by the set. Under these circumstances, the radar set on the S. S. ARROW was rendered useless as a navigational aid.

Radio Direction Finder: This navigational aid was in working condition at the time of the grounding.

Echo Sounder: The echo sounder on board the ARROW was not working at the time of the grounding and had not been working since the Captain took command of the ship.

Mechanical Depth Sounder: This apparatus was in working order but it was not rigged for

immediate use prior to the time of the grounding.

Hand Lead: There was a hand lead on board the S. S. ARROW at the time of the grounding.

Sextant: This instrument was used to determine the noon-hour position of the S. S. ARROW during the voyage.

- (c) Was full and proper use made of these aids during the hour preceding her grounding?

**ANSWER:** Magnetic Compass: No use was made of the magnetic compass as the Master was navigating by gyro compass at all times.

Gyro Compass: Use was made of the gyro compass during the period in question for the steering of the ship. During the hour preceding her grounding, however, no use was made by the Captain or crew of the S. S. ARROW of either the magnetic or gyro compasses for the purpose of determining bearings on land based points. No attempt was made to establish the position of the ship after the last alteration of course by this fundamental method of navigation, and it therefore cannot be said that full and proper use was being made of these navigational aids.

Radar: Captain Anastassopoulos attempted to use the radar set and placed too much reliance upon it when it was not functioning efficiently due to spoking.

Radio Direction Finder: No use was made of this navigational aid as the Captain felt that bearings taken by RDF would not be sufficiently accurate for his purposes.

Echo Sounder: No use was made of the echo sounder as it was not working.

Mechanical Depth Sounder: No use was made

of this navigational aid but in the opinion of of the Court it is doubtful if its use would have been of any real assistance to the navigator in the waters of Chedabucto Bay.

Hand Lead: This was not used.

Sextant: The sextant was used only for determination of noon positions of the ship.

7. (a) What land based aids to navigation (including floating aids) were available to mariners in or near Chedabucto Bay?
- (b) Were these aids available to the ARROW?
- (c) Were these aids functioning correctly on February 4th, 1970, and were they adequate?

The Court will deal with (a), (b) and (c) of Question 7 together.

**ANSWER:** Loran Navigation System: The Loran Navigation System was available to mariners navigating off the coasts of Nova Scotia. Its use is most suitable as an aid to mariners at sea rather than in coastal waters. The Loran Navigation System was not, however, available to the S.S. ARROW as it was not supplied with a Loran receiver by the owners.

Decca Navigation System: The Decca Navigation System is available to mariners in the Chedabucto Bay area and is particularly suitable for providing rapid and constant position fixes for ships approaching or sailing in coastal waters. This system was not available to the S. S. ARROW, however, as her owners had not installed the necessary equipment for its use.

Radio Direction Finding Station at Cranberry Island: This station was functioning correctly

on February 4th, 1970, and was available to the S. S. ARROW but no use was made of the system.

Lighthouses and Ranges:

(1) Cranberry Island Light: This light stands 58 feet above high water mark and is visible for twelve miles in clear weather, as a flashing light. It is equipped with radio beacon and fog signal (diaphone). It was available to the S. S. ARROW and functioning correctly on February 4th, 1970, and was in fact used by the Captain of the S. S. ARROW to determine his position at 0810 and 0815. This lighthouse could be seen by Captain Anastassopoulos, both by radar and visually.

(2) Canso Range: This range consists of two yellow lights 40 and 97 feet in height which were probably beyond the visual range of the S. S. ARROW.

(3) Canso Harbour Range: This range consists of two fixed green lights 30 and 41 feet in height which would probably be beyond the visual range of the S. S. ARROW.

(4) Canso Harbour Light (North end of Hart Island): This light is a fixed red light 48 feet high and is equipped with a fog signal (diaphone). It was probably beyond the visual range of the S. S. ARROW.

(5) Green Island Light: This light is 119 feet above high water mark, exhibits a flashing white light with a range of 16 miles. It is also equipped with fog signals (horn). This aid was available to the S. S. ARROW on the morning in question by radar and by sight under the conditions of visibility which existed at the time. It was functioning correctly.

(6) Petit-de-Grat Outer Range: This range consists of two fixed white lights 50 and 28 feet in height. It was probably beyond the visual range of the S. S. ARROW.

(7) Petit-de-Grat Inner Range: This range consists of two fixed amber lights 45 and 53 feet in height. It was probably beyond the visual range of the S. S. ARROW.

(8) Petit-de-Grat Lighthouse: This light is 32 feet high and exhibits a fixed red light. It was within the visual range of the S. S. ARROW but its light would have been extinguished by the time the S. S. ARROW passed. It still should have been available by sight or by radar to the S. S. ARROW and it was functioning correctly on the day in question.

(9) Arichat Lighthouse: This light is a fixed white light 34 feet high, located at Marache Point and visible for a distance of 11 miles. It is equipped with a fog signal (horn) which is designed to answer vessels' signals. This lighthouse was available to the S. S. ARROW visually and by radar as a point of land. Its light would also be extinguished by the time the S. S. ARROW passed.

(10) Jerseyman Island Light: This aid maintains a red flashing light and fog signals (trumpet). The light had been extinguished at 0845 but the tower of the lighthouse would have been available to the S. S. ARROW visually or by radar if its radar had been functioning. Mr. LeBlanc, keeper of this light, sighted the S. S. ARROW visually when it was grounded on Cerberus Rock, a distance of three and one-half miles, at 0945

on the morning of the 4th. He placed the visibility at that time at six miles. Mr. LeBlanc also verified that the fog signal at the Jerseyman Light had not been turned on that morning, as there was no requirement for it. None of the fog signals at any of the lights in and around Chedabucto Bay was in fact being used on the morning in question, as there was no fog condition requiring them to be placed in operation.

(11) Creighton Head Light: This aid is a flashing white light 38 feet high. The light would have been extinguished and was probably beyond the visual range of the S. S. ARROW.

(12) Eddy Point Lighthouse: This aid is a fixed white light, 42 feet high, visible 11 miles. It is equipped with fog signal (diaphone). This lighthouse was beyond the visual range of the S. S. ARROW and did not have a radar reflector.

(13) Buoys: In addition to the manned and unmanned lighthouses and ranges previously mentioned, and some further lights and ranges closer to Port Hawkesbury, the Department also maintains a series of buoys in Chedabucto Bay;

(a) Grime Shoal gas and whistle buoy (replaced by winter spar buoy). This buoy was available to the S. S. ARROW and used by her Captain to establish his position for change of course into Chedabucto Bay. The buoy was on station and although the chart called for a lighted whistle buoy, the Captain apparently accepted the winter replacement spar buoy as being the charted buoy, and placed full reliance on it.



(b) Canso Harbour Fairway gas and whistle buoy. This buoy had a light and radar reflector but was probably beyond the visual range of the S. S. ARROW. It was on station and functioning correctly.

(c) Orpheus Rock gas and bell buoy (replaced by winter spar buoy). This buoy was probably beyond the visual range of the S. S. ARROW.

(d) Petit-de-Grat gas and whistle buoy (replaced by winter spar buoy). This buoy was probably beyond the visual range of the S. S. ARROW.

(e) Cerberus Rock gas and whistle buoy (replaced by winter spar buoy). This buoy was on station and well within the visual range of the S. S. ARROW.

(f) Other buoys in Chedabucto Bay as shown in the list of lights, buoys and fog signals Atlantic Coast 1969 were beyond the visible limits of the S. S. ARROW.

The system of navigational aids referred to above, established and maintained in and around Chedabucto Bay by the Department of Transport, were, in the opinion of this Court, perfectly adequate for the guidance of Canadian and foreign-going ships approaching the Strait of Canso through Chedabucto Bay. Cerberus Rock is the only navigational hazard to be found in this broad expanse of water leading towards the Strait of Canso, and a navigator has at least six miles of deep water to the south of the Rock through which he may take his ship.

Counsel on behalf of the owners argued at

great length that the replacement of the Cerberus Rock gas and whistle buoy by a winter spar buoy was the ultimate cause of the grounding. It was suggested that even though the ship was well off her course, she would have been able to avoid the grounding had she been able to see the Cerberus Rock buoy and that the Department in changing the buoys was negligent and responsible for the subsequent grounding and damage to the ship. Counsel for the owners admitted that the Department had the right to change the buoys but argued that proper notice of the change had not been brought home to the Master of the S. S. ARROW and this lack of notice misled him into relying upon the presence of the regular summer buoy which could be readily seen and would act as a warning of the hazard in ample time to avoid the grounding. The Court does not accept this reasoning. The Department of Transport is justified in replacing the summer buoys with winter spar buoys in areas where either icing of the buoys or floating ice or general winter conditions are liable to cause the buoy to get off station, and thereby become more of a hazard than an aid to navigation. Secondly, the evidence indicates that there is really very little difference between the ability to observe the summer and winter type buoy in rough weather. Thirdly, the Captain of the S. S. ARROW had already observed the winter spar buoy replacing the Grime Shoal summer buoy and had relied upon it even though it differed from the charted buoy.

As indicated above, it was not the winter spar buoy properly on location that caused the grounding of the S. S. ARROW, but the failure of

the Captain to establish and know his position with the available aids to navigation in the area. In the opinion of this Court, the aids to navigation available to mariners in and about Chedabucto Bay were perfectly adequate for the volume and type of shipping using these waters at the time of the grounding of the S. S. ARROW.

The evidence revealed that a much more extensive system for the guidance of ships entering Chedabucto Bay had been planned for the area prior to the grounding of the S. S. ARROW. The reason for this new system was to accommodate the new traffic of super-tankers expected to be calling at the developing industrial area in and around Port Hawkesbury, Nova Scotia. The fact that this new navigational aid system was being developed for Chedabucto Bay was in no way an indication that the existing system was not adequate for the traffic using these waters at the time of the grounding. Two hundred super-tankers per year are expected to pass through the Bay in the future, many of which have a draft of more than 80 feet, and it is for this reason that a proper channel must be marked by a series of buoys maintained on station the year around in order to insure safe navigation in the future.

- (d) Were notices of changes in navigational aids sufficiently published to mariners approaching Chedabucto Bay on or about February 4th, 1970?

**ANSWER:** The only change in navigational aids in Chedabucto Bay was the removal of some of the summer whistle buoys and their replacement by winter spar buoys. Notice of these changes was broadcast over Halifax,

Canso and Sydney marine radio stations from January 9th to February 2nd, when they were cancelled. Due to an error at Sydney radio station, the notice was not cancelled and continued to be broadcast up until the time of the grounding.

The notice was as follows:

"All buoys from Cape St. Lawrence to Liscombe Island, including Bras d'Or Lakes, also LeHave River and Mahone Bay, are now being lifted to protect them from damage by ice."

This message was broadcast by wireless telegraphy four times each day with the initial call being made on the international distress frequency and the message was then delivered on the working frequency of each station. It was also broadcast twice daily by radio-telephony with the initial call on the international distress frequency and the message being broadcast on the working frequency of each station. The range of the wireless telegraphy would be between 400-500 miles under average conditions and the range of RT would be about 300 miles. The frequencies upon which the broadcasts are made are published every three months in Canadian Radio Aids to Marine Navigation.

Notice of these changes was also published in the January 23rd, 1970 edition of Canadian Notices to Mariners. This notice was as follows:

"All steel buoys east of Liscombe (44° 55' 00" North, 61°53'34" W approx.) including Cape Breton Island and the Bras d'Or Lakes to Cape St. Lawrence (47°03'00"N, 60°35'00"W approx.) have been lifted temporarily to protect them from ice damage, and the critical buoy position will be replaced by winter spars."

Those mariners who are out of range of the Canadian Marine radio stations when Notices to Shipping are broadcast, and have been unable to obtain the latest issue of Notices to Mariners, may, of course, call directly to a Canadian Marine radio station to obtain the information before entering Canadian waters. If they prefer they can arrange to have their agents obtain the information and relay it to them.

Should a mariner approaching Chedabucto Bay not carry any of the Canadian publications, as was the case with the S. S. ARROW, there are general warnings concerning the replacement of buoys during winter months contained in the British and American publications. The St. Lawrence Pilot, a British publication which covers the Chedabucto Bay area, has this to say about the buoyage season:

"Buoys in Canadian waters are, generally speaking, maintained in position during the season of navigation. In localities where the lights are maintained in operation throughout the year buoys are always kept in position. In districts where navigation is closed in winter, the buoys are kept out in autumn until the last vessel has cleared, or as late as the ice will allow, with due regard to their safety. The buoys are replaced in the spring as soon as the ice will permit.

All the buoys including the light buoys, in the lower St. Lawrence between Gaspé and Quebec and in Northumberland Strait, are placed in position as early as possible after the ice passes down each Spring, and are removed each Autumn, after November 10th, the date varying with the season, and every effort is made to leave them out so long as the state of the ice permits, but the later vessels must not expect to find them in position after the ice has

"begun to run. Some of the more important buoys, if lifted before the last vessel has passed out, are temporarily replaced by wooden spars, in which case the pilots are duly notified, then no special notices to mariners describing the removal or replacing of buoys each season are issued."

There is a similar reference to the buoyage season in the Canadian Gulf of St. Lawrence Pilot which reads as follows:

"Buoys in Canada are, generally speaking, maintained in position during the season of navigation. In localities where the lights are maintained in operation throughout the year, the buoys are kept out in Autumn until the last vessel has cleared, or as late as the ice will allow, with due regard to their safety. The buoys are replaced in the Spring, as soon as the ice will permit, in order of priority, according to their relative importance to navigation."

In the opinion of the Court, notices of changes in navigational aids were sufficiently published to mariners approaching Chedabucto Bay, on or about February 4th, 1970, and any mariner who wished to check any such changes could do so by (1) listening to Canadian Notices to Shipping broadcast by marine radio, or (2) reading Canadian Notices to Mariners, or, (3) making inquiries at any Canadian Marine radio station, or (4) contacting his local agent in advance of arrival.

It is recommended, however, that the reference to the "buoyage season" in the Canadian Gulf of St. Lawrence Pilot be altered so as to make it clear that some buoys in the Chedabucto Bay area are lifted during the winter season and

replaced by winter spar buoys. It should be stated that this is done in order to maintain the buoy position under winter conditions, rather than for the purpose of preventing damage to the buoy by floating ice. Under the wording of the existing Canadian Pilotage publications a navigator may expect to find a charted buoy in position if there are no ice floes in the vicinity, unless he has seen the Notice to Mariners or heard the Notice to Shipping concerning the change.

- (e) Did the S. S. ARROW use all reasonable means to obtain information of changes in navigational aids in or near Chedabucto Bay on or before February 4th, 1970?

**ANSWER:** The Captain of the S. S. ARROW made no effort to determine whether there had been changes in navigational aids in Chedabucto Bay before his arrival. He relied solely upon the radio operator to bring to his attention any such notices that he may receive and although notices were broadcast after the S.S. ARROW was in radio range, no such notice was brought to the attention of the Captain. No attempt was made under the Captain's direction to obtain this information either from Canadian Marine radio stations or from the ship's Canadian agent.

8. (a) Was the ARROW supplied with adequate charts and marine publications for the voyage on which she grounded?

**ANSWER:** The S. S. ARROW was supplied with British and American charts and publications only. In the opinion of this Court these charts and marine publications were adequate for the voyage on

which she grounded.

(b) Was full and proper use made of them?

**ANSWER:** The Captain of the S. S. ARROW was not making full and proper use of the pilotage publications which he had on board when he was attempting to fix his position by the Cerberus Rock buoy. The St. Lawrence Pilot, published by the British Admiralty, gives a clear warning against this practice as follows:

"It is manifestly impossible that any reliance can be placed on buoys always maintaining their exact position. Buoys should, therefore, be regarded as warnings and not as infallible navigating marks, especially when in exposed positions; and a ship should always, when possible, be navigated by bearings of fixed objects on shore or angles between them, and not by buoys."

9. With what cargo was the ARROW loaded at the time of her grounding?

**ANSWER:** The S. S. ARROW was loaded with 16,010 tons of Bunker C fuel (industrial C 561) and 79.5 tons of a lighter grade fuel.

10. (a) Who was in command of the S. S. ARROW on February 4th, 1970 and what certificate of competency did he hold?

**ANSWER:** Captain George Anastassopoulos was in command and he holds a Master's certificate ALPHA for sea-going vessels issued by the Department of Merchant Marine of Greece and a Master's certificate foreign-going issued by the Republic of Liberia.

(b) How many deck officers did she carry and what



certificates of competency did they hold?

**ANSWER:** She carried three deck officers: a Chief Mate, Second Mate and Third Mate. The Chief Mate and Second Mate were licensed and the Third Mate was not, although he had graduated from a nautical academy.

(c) How many of a crew did she carry?

**ANSWER:** Thirty-four.

11. (a) Who had the conduct of the S. S. ARROW when she grounded?

**ANSWER:** The Master, Captain George Anastassopoulos.

(b) Who was on the bridge of the S.S. ARROW when she grounded?

**ANSWER:** The Master, the Third Mate, the helmsman and an Able Seaman lookout by the name of Boukalis.

12. What was the state of the weather, wind, sea and visibility at the time of her grounding?

**ANSWER:** The weather was overcast with patches of mist. The wind was southerly, Force 7 to 8. The sea was running northerly and the waves were 4 to 6 feet with the tops of the wave 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.

13. What messages were transmitted from the S.S. ARROW in the hours following the grounding?

**ANSWER:** Captain Anastassopoulos says that he cabled Olympic Maritime, SA and asked them to send a tug and large barge to his assistance, but there's no evidence

indicating when this message was sent. The first message revealed by the evidence was delivered at 1145 local time. Mr. Langley, who owned the pilot boat which was waiting for the arrival of the S. S. ARROW, testified that he received a message at this time from the ARROW indicating that she was aground and that her engines were running full speed astern and her heading had shifted 110°. Mr. Langley was asked to notify the ship's agent at Port Hawkesbury so that the agent could notify New York to make arrangements to obtain assistance to get him out of that position.

About Noon, Captain Anastassopoulos contacted C.C.G.S. Narwahl and advised that he was aground on Cerberus Rock and required no immediate assistance. He also advised that his cargo was fuel oil.

The messages that were transmitted from the ARROW subsequently are as follows:

TO	FROM	MESSAGE	LOCAL TIME
<u>February 4, 1970</u>			
5LHI		REPORTS AGROUND ON CEREBUS ROCK ADV REQ NO IMMEDIATE ASSISTANCE ADV FUEL OIL CARGO	1226
5LHI		CALL NRE	1417
VAX	CGBP	ADV ARROW CALLING ON 2182	1425
5LHI		ADV IF YOU ARE PLANIN TO UNLOAD ANY OF YOUR OIL CARGO? NEG	1454
5/LHI	PILOT BOAT	CALL ARROW ANSWRS PILOT BOAT DOES NOT ANSWR	1530

TO	FROM	MESSAGE	LOCAL TIME
5/LHI	PILOT BOAT	CONTACTS ARROW SHIP LEAKING OIL IN SEA	1537
5/LHI		DO YOU REQUIRE ASSISTANCE NEG NOT AT THIS MOMENT WILL CALL IF I DO	1550
5LHI	VCS	51	1608
5LHI		ADV VCS LNG 51/R	1610
5LHI		ADV VCS HAS DX BUT UNABLE READ U THIS FREQ/R 51	1619
5LHI		IN <sup>FO</sup> FM VCS RE QTA DX CL TO/R 51	1625
PILOT BOAT	ARROW	REQUIRE IMMEDIATE ASSISTANCE TO REMOVE CREW 51	1725
ARROW		CLB 51 NRH	1726
	ARROW	RQ IMMEDIATE ASSISTANCE IF NEED ARISES TO DISEMBARK CREW SHIP NW IN WORSE CONDX/B WL ADV RCC 51	1731
5LHI	CGBP	51	1830
CGBP		ADV 5LHI CLNG ON 51/R	1832
PILOT BOAT	5LHI	QSO RE GRNGNG WITH AGENT 5LHI ADV STILL FIRMLY AGRND 51	1912
CGBP	5LHI	QTH?/R 2-1/2 MILES FM U/R CAN U GET CLOSER/R WHEN WIND DROPS/R 51	1915
5LHI	PILOT BOAT	51	2017
ARROW	VCS	51 NRH	2024
ARROW		CLD 51 NRH	2025
ARROW	CGBP	51	2043
CGBP	5LHI	51	2100

<b>TO</b>	<b>FROM</b>	<b>MESSAGE</b>	<b>LOCAL TIME</b>
<b>PILOT BOAT</b>	<b>5LHI</b>	<b>STILL AGND BUT SHIP ROLLING ON ROCKS/AGENT ADV TUG ON WAY ETA 3 OR 4 HOURS FM NW 51</b>	<b>2106</b>
<b>CGBP</b>	<b>5LHI</b>	<b>CONDX WORSE PSE CUM VRY CLOSE IF HVE ABANDON/ 51</b>	<b>2135</b>
<b>5LHI</b>	<b>CGBP</b>	<b>HW MANY ONBOARD/R 34</b>	<b>2153</b>
<b>5LHI</b>	<b>CGBP</b>	<b>51</b>	<b>2241</b>
<b>ARROW</b>	<b>SHEDIAC BAY</b>	<b>WX IMPROVING &amp; NW PROCEEDING UR PX/R 51</b>	<b>2303</b>
<b>5LHI</b>	<b>CGBP</b>	<b>51</b>	<b>2337</b>
<b>5LHI</b>	<b>SHEDIACH BAY</b>	<b>SOUNDING MACHINE OUT OF ORDER CAN U CONFIRM TO ME WHAT SIDE OF ROCK ARE YOU AGROUND/R STBY</b>	<b>2431</b>
<b>SHEDIAC BAY</b>	<b>5LHI</b>	<b>OUR PX SHIP AGROUND CEREBUS ROCK 45.27.7 N 61.06.5 W/R HVE THAT BUT WISH TO KNOW WHICH SIDE OF ROCK YOU ARE AGROUND/R STBY</b>	<b>2434</b>
<b>SHEDIAC BAY</b>	<b>5LHI</b>	<b>WE ARE AGROUND BETWEEN BUOY AND ROCK/R THAT WEST SIDE. WE ARE 4.5 MILES FRM YOU AND DIPPING QUITE A BIT. WE WILL PROCEED CLOSER AND WILL BE STANDING BY/R STNDG BY</b>	<b>2436</b>
<b>ARROW</b>	<b>SHEDIAC BAY</b>	<b>CLL CH 51</b>	<b>0124</b>
<b>5LHI</b>	<b>PRTHWKS PLT</b>	<b>CLL CH 51</b>	<b>0145</b>
<b>5LHI</b>	<b>PRTHWKS PLT</b>	<b>CLL CH 51</b>	<b>0206</b>
<b>5LHI</b>	<b>SHEDIAC BAY</b>	<b>CLL ADVSNG PRT HWKS PLT CLLNG/R SO IF NECESSARY TO PICK UP CREW/R IF URGENT HAVE NO SOUNDER/R STBY</b>	<b>0208</b>

TO	FROM	MESSAGE	LOCAL TIME
PRT HWKS PLT	5LHI	SITUATION SHIP NOW HAS LIST PORT SIDE AND SEA COMING FROM PORT SIDE ON DECK/R TUG BOAT WILL NOT ARRIVE TO YOU UNTIL 9-10 AM...../ SHIP IN DANGEROUS CONDITION LISTING ON PORT SIDE AND STRIKING ON ROCKS FUEL IS READY..../R STANDING BY/R	0208/11
5LHI	CGBP	CLL CH 51 HOW ARE YOU MAKING OUT /SITUATION IS WORSE MORE DANGEROUS CONDITION OUR DECK SAME AS SURFACE THE SHIP HAS LIST PORT SIDE...(FDING)/IS STARBOARD SIDE BEST SIDE FOR TAKING MEN OFF IF WE HAVE TO COME IN/R STERN STARBOARD SIDE/ DO YOU WANT BOAT TO COME IN NOW TO TAKE MEN OFF/CAPTAIN SAYS YOU CAN SEND BOAT TO TAKE SOME MEN/R WILL DO THAT AS SOON AS POSSIBLE.	0225/30
5LHI	CGBP	CLL CH 51	0236
5LHI	CGBP	WE ARE COMING IN TO TAKE OFF SOME OF YOUR CREW WITH OUR BARGE. COULD YOU HAVE A LINE READY FOR THE BARGE TO SECURE TOO/R WE WILL DO IT/R	0237
5LHI	CGBP	OUR CAPTAIN WISHES TO PASS MSG TO YOU. WE CAN TAKE 15 PEOPLE ON THE BARGE/ PSE RPT.RPTD.R	0245
5LHI	CGBP	CLL CH 51 WILL YOU CALL US AND LET US KNOW WHEN BARGE IS ALONG SIDE OF SHIP AND WHEN BARGE DEPARTS FROM SHIP/RB/R THAT IS CORRECT/R WILL LET YOU KNOW	0300
CGBP	5LHI	THE BIG BOAT WAS ALONG SIDE AND ONLY 3 PEOPLE ONBOARD. SMALL BOAT NOW ALONG SIDE TRYING TO TAKE SOME/R	0306

TO	FROM	MESSAGE	LOCAL TIME
5LHI	SHEDIAC BAY	CLL CH 51. HOW MANY MANY MORE DO U HAVE TO COME OFF AND ARE YOU GOING TO LEAVE ANY ON BOARD/ WILL TELL YOU IN MIN STBY/R/ 21 PRSNS ON BOAT 13 MORE ON SHIP. LAST TO LEAVE WILL BE ME, RADIO OFFICER, AND CAPTAIN/R THEY WILL BE LEAVING TO PICK YOU UP RIGHT AWAY/R	0340/43
CGBP	5LHI	CLL CH 51, NOW CAPTAIN AND ME, RADIO OFFICER, ARE GOING TO STERN FROM CENTER OF VESSEL. NO RADIO COMMUNICATION. I WILL LEAVE R/T SET ON IN CASE I HAVE TO COME BACK TO CALL YOU/R	0351/53
5LHI	SHEDIAC BAY	CLL ADVS IF WAITING TO BE TAKEN OFF/R PSE COME NOW/R	
CGBP	5LHI	HOW LONG FOR U TO ARRIVE TO SHIP/DNT KNW YET STBY/R	0510/16

14. What was the cause of the grounding?  
ANSWER: The grounding was caused by the Master's error in judgment when making allowance for existing wind, sea and tidal conditions in establishing the course to be steered into Chedabucto Bay, and by the Master's failing to insure that his last alteration of course was made accurately at the time and plotted position which he had selected, and by the Master's failure to check his ship's position and relate it to its plotted course by visual use of the navigational aids available to him when his radar was not functioning efficiently.

15. Was the grounding and subsequent sinking of the S.S. ARROW caused or contributed to by any wrongful act or default of any person or persons and, if so, what were those wrongful acts or defaults and by whom were they committed?

ANSWER: The grounding and subsequent sinking of the S.S. 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.

DATED at Halifax, Nova Scotia, this  
day of July, 1970.



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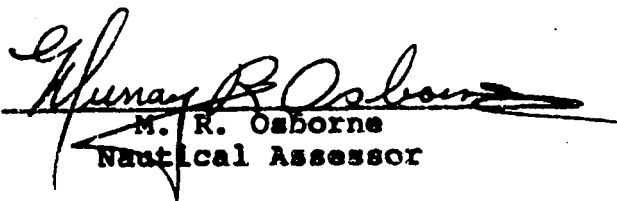
Justice G. L. S. Hart  
Commissioner

CONCURRED WITH:



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Captain A. R. Caldwell  
Nautical Assessor



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M. R. Osborne  
Nautical Assessor