PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

OIL SPILLS

Prevention and Control of Oil Pollution in the Marine Environment

Report from the House of Representatives
Standing Committee on Environment and Conservation

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HOUSE OF REPRESENTATIVES STANDING COMMITTEE ON ENVIRONMENT AND CONSERVATION

The Committee was appointed by resolution of the House of Representatives on 2 March 1978 to inquire into and report on -

(a) environmental aspects of legislative and administrative measures which ought to be taken in order to ensure the wise and effective management of the Australian environment and of Australia's natural resources, and

(b) such other matters relating to the environment and conservation and the management of Australia's natural resources as are referred to it by -

(i) the Minister for Environment, Housing and Community Development, or

(ii) resolution of the House.

These terms of reference are identical with those of the Committee of the Thirtieth Parliament. On 24 February 1977 the Committee resolved to inquire into Oil Spills in the Marine Environment.

At the dissolution of the Thirtieth Parliament, the Committee had made considerable progress in its investigations. On 14 March 1978 a Sub-committee was appointed to continue the Oil Spills Inquiry.

The Committee appreciates the contributions made to the Inquiry by the Hon. G.M. Bryant, E.D., M.P., the Hon. M.H. Cass, M.P., and Mr I.B.C. Wilson, M.P. who were Members of the previous Committee.

MEMBERS OF THE COMMITTEE IN THE 31ST PARLIAMENT

Chairman	Mr J.C. Hodges, M.P.
Deputy Chairman	Dr H.A. Jenkins, M.P.
Members	Mr M. Baillieu, M.P.
	Mr B. Cohen, M.P.
	Mr J.F. Cotter, M.P.
	Mr P.S. Fisher, M.P.
	Mr B.L. Howe, M.P.
	Mr B.D. Simon, M.P.
Clerk to the Committee	Mr J.R. Cummins

MEMBERS OF THE SUB-COMMITTEE

Chairman	Mr J.C. Hodges, M.P. (until 1 August 1978)
	Mr M. Baillieu, M.P. (from 1 August 1978)
Members	Mr B.L. Howe, M.P.
	Mr B.D. Simon, M.P.
Clerk to the Sub-committee	Ms L. Simons

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FINDINGS

After consideration of the evidence placed before it, the Committee makes the following findings:

1. With increasing importation of oil and refined products to Australia there is a serious threat of larger and more frequent oil spills.

2. Oil spills cause substantial environmental and economic damage:

   - they require rapid reaction if damage is to be minimised or prevented and this requires adequate equipment and training.

3. Not enough emphasis is currently being placed on methods of preventing spills.

4. The likelihood of an oil spill disaster depends largely on:

   - the performance of people involved in the industry, both on land and at sea; and

   - the standard and maintenance of equipment.

5. The ability to cope adequately with an oil spill disaster depends largely on:

   - the location of the spill;

   - the quality and quantity of combat equipment and personnel, and the ability to reach the spill site quickly;

- the co-ordination of all organisations involved in clean-up action;

- the adequacy of contingency arrangements; and

- weather conditions and tidal movements.

6. Australia has only limited resources for dealing with oil spills. If a large spill occurred near land, it is unlikely that widespread contamination of coastal areas could be prevented.

7. Environmental damage caused by frequent, small oil spills (chronic) is often as great, if not greater, than large, once-only spills (episodic):

   - not enough significance is attached to preventing small spills and dealing with them in an environmentally acceptable way; and

   - for smaller spills there is a need to upgrade physical recovery capability for sheltered and open waters.

8. Australian contingency arrangements should provide for co-ordination of action to deal with oil spills from all sources:

   - joint arrangements are required between

     . Commonwealth and State Governments involving all relevant Departments and organisations;
     . local government;
     . the shipping industry; and
     . the oil production, refining and exploration industries.

- these joint arrangements should provide for

  . joint exercises and training;
  . assessment of the capacity to deal with oil spills;
  . equitable financial contributions; and
  . a common philosophy.

- a Commonwealth supplement to the National Plan would be appropriate in this context.

9. The National Plan to Combat Pollution of the Sea by Oil is an effective program to deal with the contingencies it was established to handle. There is a need to expand the Plan to deal with possible spills from sources other than shipping. Although the Plan's resources would be made available for a spill for a non-shipping accident, the Committee is concerned that contingency plans for such incidents are not established.

10. The objective of dealing with oil spills is primarily to protect the environment. There should be full environmental participation in contingency planning and action arrangements:

- environmental specialists should be advised of all spills; and

- provision needs to be made to advise any groups or associations if property is likely to be damaged in any way, to allow them an opportunity to take avoidance action.

11. Dispersants damage the marine environment and their use should be restricted and carefully monitored:

- dispersants should meet defined efficiency and toxicity standards; and

- Governments must have the strength to do nothing in the face of a serious spill if this is deemed the best approach. Decisions that would cause greater environmental damage must not be taken as a result of ill-informed public pressure.

12. Monitoring the effects of oil pollution and actions taken to deal with it can provide important information for:

- compensation;

- reviewing adequacy of contingency arrangements; and

- developing reclamation proposals for the affected areas.

13. There is a need for research into the possible effects of oil in Australian conditions on Australian species.

14. The Committee is pleased to see some States undertaking programs designed to identify areas of special ecological significance. This should be done on a national scale.

RECOMMENDATIONS

The Committee recommends that:

1. the Australian Maritime College give priority to the introduction of comprehensive training courses in tanker safety;

(paragraph 44)

2. the Commonwealth Government take immediate steps to enable Australian ratification of the International Convention on Training, Certification and Watchkeeping for Seafarers;

(paragraph 48)

3. the Hydrographic Service of the Royal Australian Navy give consideration to widening the recommended tracks on navigation charts, particularly in the Torres Strait and Great Barrier Reef, in consultation with the Queensland Coast and Torres Strait Pilot Service;

(paragraph 54)

4. the Commonwealth Government, at an international as well as national level, encourage the acceptance of compulsory pilotage for all oil tankers and other types of vessels over 10,000 tons in areas where detailed local knowledge is required for safe navigation;

(paragraph 58)

5. the Minister for Transport review, as a matter of urgency, the provision of navigation aids in hazardous areas, with particular reference to the addition of two telemetric tide gauges in the Torres Strait;

(paragraph 66)

6. (a) the Department of Transport investigate, and report to the Minister on possible ways of reporting suspect shipping;

(b) the Department of Transport compile an official register of ships failing to meet adequate equipment and safety standards for use by harbour authorities in routine inspections;

(paragraph 68)

7. the Commonwealth Government increase the funds available for hydrography work in Australian coastal waters to hasten the upgrading of navigation charts;

(paragraph 77)

8. the Commonwealth Government make representations at an international level to have the restricted zones around Australian offshore oil platforms extended to a distance of 2.5 nautical miles;

(paragraph 86)

9. the Minister for Science assess the use of satellites in the field of detection and monitoring of oil spills to determine their suitability for incorporation in the Australian surveillance network;

(paragraph 91)

10. the Department of Science, in conjunction with the Department of Transport, assess the feasibility of introducing cargo-tagging programs with a view to introducing such a system to Australia;

(paragraph 96)

11. the Commonwealth Government encourage State Governments to amend their legislation to increase penalties for oil pollution of the sea;

(paragraph 104)

12. the Commonwealth Government take immediate steps to ratify the International Convention on Civil Liability for Oil Pollution Damage 1969 and the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage 1971;

(paragraph 167)

13. the National Plan should be equipped to respond to an estimated pollution threat calculated on the basis of the size and volume of shipping using Australian waters;

(paragraph 181)

14. (a) on-site controllers inform environmental officers of any oil spill as a matter of course;

(b) once alerted, the environmental officers should determine the extent of their involvement, in an advisory role, in monitoring and clean-up strategies;

(paragraph 187)

15. the Department of Transport in conjunction with State governments and the oil industry establish a register containing information on oil cargoes and frequency and location of spillage;

(paragraph 191)

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16. the Department of Transport, in consultation with the Department of National Development and the Petroleum Institute Environmental Conservation Executive prepare an operational plan which will facilitate the movement and use of National Plan resources in the event of a pollution incident caused by offshore operations or shore-based facilities;

(paragraph 198)

17. the Minister for Transport evaluate alternative levy schemes to determine the most equitable and administratively effective system of levying shipping interests;

(paragraph 203)

18. the Minister for Transport determine an equitable basis for contribution from offshore and land-based installations to the National Plan;

(paragraph 205)

19. the Minister for Science review priorities to determine the need for increased allocation of resources to marine science research;

(paragraph 210)

20. the Prime Minister request the Australian Science and Technology Council to examine the need for increased marine science research;

(paragraph 211)

21. the Australian Institute of Marine Science undertake a research program aimed at monitoring marine ecosystems in the Great Barrier Reef area and that CSIRO establish stations throughout Australia to monitor marine waters;

(paragraph 215)

22. the Commonwealth Government and the oil industry undertake a joint research project on the toxicity of dispersants and oil/dispersant mixtures on Australian species under Australian conditions;

(paragraph 218)

23. the Department of Transport continue to monitor international developments in recovery equipment to determine suitability for the Australian situation. Should such equipment become available, the reliance on dispersants as a primary method of treating oil pollution should cease;

(paragraph 220)

24. in situations where dispersants from the National Plan stockpile are used, a report be presented to the Department of Transport, as controller of the National Plan, to enable the compilation of data on the usage and success of dispersants;

(paragraph 222)

25. the Department of Transport and the Department of Environment, Housing and Community Development hold discussions to consider the possibility of extending the National Plan to Combat Pollution of the Sea by Oil to include pollution by other hazardous substances;

(paragraph 238)

MINISTERS WITH RESPONSIBILITY FOR IMPLEMENTING RECOMMENDATIONS

Although implementation of the recommendations in this Report requires liaison between a number of Commonwealth Departments, the Minister with prime responsibility for action in dealing with the recommendations is indicated below.

MINISTER	RECOMMENDATION (Paragraph)
Prime Minister	2(48), 4(58), 11(104), 20(211)
Minister for Education	1(44)
Minister for Transport	5(66), 6(68), 8(86), 10(96), 12(167), 13(181), 14(187), 15(191), 16(198), 17(203), 18(205), 23(220), 25(238)
Minister for Defence	3(54), 7(77)
Minister for National Development	16(198)
Minister for Science	9(91), 10(96), 19(210), 21(215), 22(218)
Minister for Environment, Housing and Community Development	25(238)

REPORT ON PREVENTION AND CONTROL OF OIL POLLUTION IN THE MARINE ENVIRONMENT

1 INTRODUCTION

1. On 24 February 1977, the Committee resolved to inquire into and report on:

> **the adequacy of arrangements to prevent or deal with oil spills in Australian waters.**

2. On 14 March 1978 the Committee decided to resume the Oil Spills Inquiry.

3. Although the reference refers to oil spills in Australian waters, the Committee confined its investigations to marine waters, including estuaries and ports and harbours. While recognising that land-based oil pollution contributes significantly to pollution of the ocean, the Committee considered it appropriate to concentrate on spills from shipping, offshore drilling rigs and shore-based facilities.

4. The establishment of the National Plan to Combat Pollution of the Sea by Oil in 1973 which is administered by the Commonwealth Department of Transport is the major initiative taken to date to combat oil pollution, and the Committee has considered the Plan in some depth.

5. The Committee and sub-committees appointed for the purpose, took evidence from 93 witnesses representing Commonwealth Government, State departments and instrumentalities, local government bodies, private industry, community

groups, marine biologists and private individuals. A list of witnesses appearing before the Committee is at Appendix 1. Public hearings were held in Canberra and interstate at which over 1300 pages of evidence were taken. Evidence given at public hearings is available for inspection in Hansard form at the National Library and the Committee Office of the House of Representatives.

6. The Committee inspected oil refineries at Kurnell, Parramatta, Altona and Westernport together with associated wharves and port facilities. The Committee also inspected production, storage and loading facilities at Barrow Island, and an offshore production rig in Bass Strait. In Queensland the Committee looked at marine research facilities and were given a demonstration of dispersant spraying equipment and mechanical recovery devices by the Department of Harbours and Marine.

7. The Committee acknowledges the co-operation and assistance provided by the oil industry throughout the inquiry together with all other witnesses who gave evidence to the Committee.

8. Although some of the evidence was taken by the Committee of the Thirtieth Parliament, the conclusions and recommendations are those of the present Committee.

2 OIL IN THE MARINE ENVIRONMENT

A. SOURCES

9. The main sources of oil in the marine environment are land-based pollution via rivers, spills from ships, natural seepage and pollution from offshore operations. It is difficult to estimate the quantities of oil entering the marine environment. Sufficient data is not available, and where it is available its accuracy is difficult to test. The Committee used global figures produced by the U.S. National Academy of Sciences which are set out in figure 1.[1]

Figure 1
SOURCE OF PETROLEUM PRESENT IN OCEANS

SOURCE	QUANTITY Million metric tons	%
NATURAL SEEPS	0.6	9.8
OFFSHORE PRODUCTION	0.08	1.3
TRANSPORTATION	2.133	34.9
LOT[a] Tankers	0.31	5.1
Non LOT Tankers	0.77	12.6
Dry Docking	0.25	4.1
Terminals	0.003	0.1
Bilge Bunkering	0.5	8.2
Accidents (tankers)	0.2	3.3
Accidents (others)	0.1	1.6
COASTAL REFINERIES	0.2	3.3
ATMOSPHERE	0.6	9.8
LAND BASED	2.5	40.9
Non Refining Industrial	0.3	4.9
Urban Runoff	0.3	4.9
River Runoff	1.6	26.2
TOTAL	6.113	100.0

a. Load-on-Top (see paragraph 40 for description).

Source: National Academy of Sciences, Petroleum in the Marine Environment, Washington, D.C. 1975

1. Transcript, 1977, pp.192-193

10. Land-based Pollution. Significant amounts of petroleum hydrocarbons are deposited in urban systems from a variety of sources including oil heating systems, atmospheric fall-out, operation of vehicles, petroleum refineries and other industrial areas. Rainfall and subsequent runoff washes these materials into the sea. It is estimated that 41% of oil entering the oceans each year is from land-based sources.

11. Land-based pollution is less dramatic than spills from ships, but is more significant in that it is occurring constantly and contributing to chronic oil pollution of some harbours and bays.

12. Spills From Ships. Ship-generated spills have been estimated at 35% of total input to the ocean. These include minor accidental spills frequently occuring during loading and unloading operations, major accidents like the recent Amoco Cadiz incident, and deliberate spills usually as a result of tank cleaning at sea. Witnesses claimed that accidental spills from ships account for only a small proportion of total ship-generated pollution.(2) It is probable that most of the oil spilled in the sea originates from a large number of small spills rather than a small number of large spills. It is evident that regular small spills cause more environmental damage than occasional large spills (see paragraphs 23 & 24).

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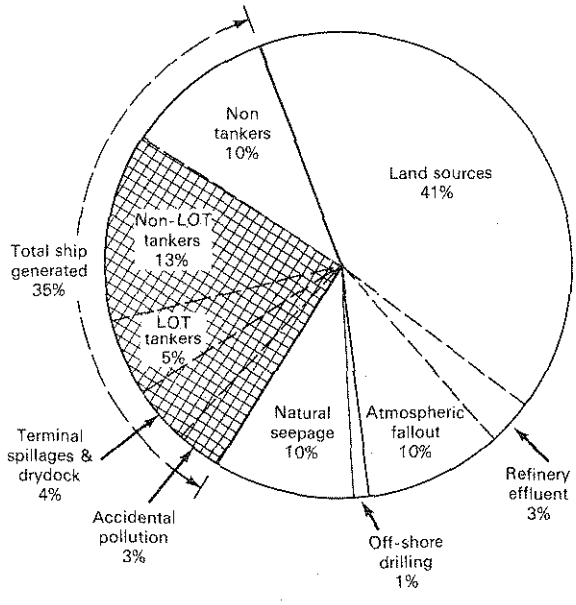
2. Transcript, 1978, p.628

13. Natural Seepage. The direct input of oil into the marine environment from natural seeps is estimated at 0.6 million metric tons per year on a global scale, or approximately 10% of oil entering the oceans (see figure 2).

Figure 2: Petroleum hydrocarbons introduced into the oceans



Source: *Petroleum in the marine environment*, National Academy of Sciences, 1973.

14. The Department of Environment, Housing and Community Development commented that too much emphasis is placed on the visible components of oil and not enough on the residual soluble components of spilt oil which are by far the

most toxic.[3] This attitude is apparent in the approach of the N.S.W. Maritime Services Board, which stated that after an oil spill, unless there is an observable effect in terms of loss of habitat or marine life, there is no reason to call in an environmental expert.[4] The widespread misconception is that if there is no visible disturbance to the environment, there is no damage of any consequence.

15. It is difficult to give a precise account of the environmental impact of oil pollution, not only because our knowledge of marine ecology is imperfect, but because there are so many variables to be taken into account. The extent and degree of damage by oil will be determined by the following factors:

- site of oil spill;
- volume of oil spilled;
- physical and chemical properties of the oil;
- oceanographic conditions;
- meteorological conditions;
- amount of suspended matter in the water;
- season of the year;
- biota present in the area;
- previous exposure to pollution;
- method of clean-up adopted.

16. At present there is no effective means of evaluating these factors to enable soundly-based counter measures to be taken in the event of a major spill.

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3. Transcript, 1977, p.266
4. Transcript, 1978, p.246

17. Offshore Oil Production. The worldwide input of oil to the ocean from offshore drilling and production is estimated at 0.08 million metric tons per year or 1.3% entering the oceans. Twenty five per cent of this is estimated to be lost through minor spills and through discharges of oil field brines during normal drilling and production operations. The remaining 75% is lost during major accidents including blowouts and ruptures of underwater pipelines. Although the risk of a major accident is small,[5] the degree of damage that could be done to the environment should a blowout occur is enormous.

B. EFFECTS

18. Major oil spills have a clear and obvious deleterious effect on the marine environment and on the communities of plants and animals living there. Oil is a conspicuous pollutant, and in particular, it has a dramatic effect on sea birds. Although long-term effects of sub-lethal concentrations of oil are not as dramatic as massive mortalities, the results may affect the survival of an important species, or alter the balance in the food chain. At present little is known of the long-term effects of oil spills and an accurate assessment of possible damage is difficult. Damage to the environment is not easy to measure objectively. The basis of environmental concern is so ill-defined, that it is not surprising that research scientists have reached widely differing conclusions about the dangers of oil pollution.

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5. Senate Select Committee on Off-shore Petroleum Resources Report, Vol. 1. Parliamentary Paper No.201, 1971, pp.486-487

Damage to Marine Life

19. There are five main ways in which oil can damage marine ecosystems. These are:

- direct coating leading to suffocation;
- lethal toxicity of oil components;
- habitat alteration;
- hydrocarbon accumulation;
- alteration of behavioural responses.

The most obvious environmental effect of oil is usually the coating of large numbers of seabirds, nearly all of which die. Treatment of the birds is expensive and usually unsuccessful. If oil arrives at breeding time, the effects can be devastating. Birds are particularly vulnerable because of their activity at the air/water interface. Surface-feeding fish together with surface-living plankton are similarly effected by oil-blanketing. If a slick arrives on shore, it traps innumerable littoral organisms.

20. The second harmful effect of oil is related to its inherent toxicity. Oil is extremely poisonous to shore plants. The aromatic components of oil are especially toxic. The overall effect is largely controlled by the manner of presentation to the organism. Thus, any suspension of fine oil droplets in seawater can be expected to harm underwater animals which otherwise might only be slightly affected by floating oil. Long-term toxicity can result from weathered oil which has sunk and then been lightly covered by sand or other sediment.

21. Oil spills cause more severe damage if they occur in near-shore areas, particularly in enclosed bays or estuaries. The extent of damage caused by spills of crude or

heavy refined oils will depend upon the time taken for the slick to reach shore. After several hours toxic components evaporate and the major effect is smothering of littoral organisms. Ecosystems appear to recover quite well from such spills although certain species may be threatened. If the slick is near a rookery, particularly during breeding season, the effects of these spills on the bird population can be catastrophic.

22. The major danger to fish lies in the damaging effect oil spills may have on near-shore nursery grounds. Larvae are considerably more sensitive to oil than adult fish. Larvael stages drift near the sea surface and are unable to avoid the toxic components of the oil. Tainting of fish following oil spills can severely affect commercial fisheries. Corio Bay in Victoria is currently closed to commercial fishing as a result of fish tainting.(6) Noticeably undesirable tastes in fish flesh can be caused by low concentrations.(7) Oil spills in Botany Bay have caused contamination of oysters with economic loss to growers.(8) The N.S.W. Oyster Farmers' Association told the Committee that the oyster industry in the Georges River could be wiped out if a major spill occurred.(9)

23. Although episodic events, such as the break-up of a large tanker, have a dramatic effect on the physical and biological environment, experience in overseas countries has shown that when the pollution passes, the ecosystems are able to recover and regenerate. The damage is more serious if one or more species is completely destroyed in an area and is unable to recolonise because of a change in the balance of the ecosystem.

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6. Transcript, 1978, p.56
7. Transcript, 1978, p.18
8. Transcript, 1978, p.223
9. Transcript, 1978, p.350

24. Chronic pollution, the long-term slow release of oil from repeated spills or industrial discharge is more serious.[10] Marine organisms do not have sufficient time between spills to allow them to recover fully. Ecosystems subject to chronic spills are continually under stress and inevitably lose many of the more sensitive marine species, which are not able to return unless the pollution is stopped.

Damage to the Physical Environment

25. The presence of oil or tar globules on a beach can have a serious impact on local communities through the loss of, or temporary damage to, recreation resources. This can lead to severe financial losses particularly in holiday areas.

26. The effects of oil spills arriving on coasts vary considerably, depending on the terrain. An unprotected ocean beach with rolling surf is highly suitable for breaking an oil slick into droplets which will eventually be removed by successive tides. High wave action may remove oil and tar within 24 hours. An open rocky shore creates sufficient wave turbulence to break up a slick, but will contain more susceptible marine creatures than the open beach. Other types of coastline are much more sensitive to oil. They include estuaries, estuarine lakes, sheltered bays, mangrove swamps, and other coastal swamps. All are remote from the weathering action of winds and waves, and all contain

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10. Transcript, 1978, p.11

important breeding grounds for marine life. Their shallow waters offer much less protection from floating oil than is afforded by the open ocean.

27. The N.S.W. Maritime Services Board said there have been instances of acute oil pollution involving temporary inconvenience, beach contamination and loss of amenity, soiling of vessels and structures, and fouling of foreshores. While these effects are unsatisfactory, they do not appear to cause permanent or irreversible damage to the environment.(11)

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11. Transcript, 1978, p.222

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3 CAUSES OF SPILLS

A. ACCIDENTAL SPILLS

28. Accidental spills range from small spills during loading and unloading operations to major disasters like the Torrey Canyon and the Amoco Cadiz incidents. Not all spills are from oil tankers. Most ships run on diesel or fuel oil and may have substantial bunkering capacities. Of world shipping only about 1 ship in 10 is an oil tanker.(1) It has been estimated that non-tankers account for 10% of oil entering the oceans (see figure 2). Although it is likely that most of these spills are relatively small, the most costly spill to date in Australian waters has been from a freighter.(2)

29. Almost all spills result from human error, or equipment failure.

Human Error or Negligence

30. Of fifty known spills in Victoria from February 1975 to January 1978, well over half occurred during bunkering operations.(3) Others resulted from bilge or ballast discharge, during deck washing or transfer operations. These spills are almost always caused by a failure to turn off valves, pipes incorrectly fitted or tanks overfilled through error or negligence.

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1. Transcript, 1978, p.343
2. The YUN-HAI, 7 March 1977, Newcastle Harbour
3. Victorian Legislative Assembly, Hansard, 12 April 1978, pp.1425-1429

Equipment Failure

31. Many spills, particularly large ones, are blamed on equipment failure. The Amoco Cadiz disaster began with a failure of steering gear. The Princess Anne Marie incident off Western Australia in 1975 was a result of structural damage during heavy seas (see Appendix 9). A spill occurred in Botany Bay due to the 'mis-design' of the shoes supporting a discharge pipeline to the Australian Oil Refinery.(4)

32. Comprehensive precautions are taken by the oil industry to prevent accidents through equipment failure and defective equipment, by fail-safe instrumentation, expert maintenance and thorough testing and inspection. This particularly applies to shore-based refineries and offshore rigs. However, the Committee was unable to evalute these mechanisms in the field.

33. Harbour authorities have the power to detain defective vessels under existing legislation.(5) On rare occasions the Maritime Services Board of N.S.W. has written to the vessel's owners or agents advising that until specified defects are correctly remedied the vessel will be prevented from working in any port within the jurisdiction of the Board. The Committee was advised that certain tankers have been 'banned' from Westernport in Victoria for bad records in terms of oil leakage.(6)

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4. Transcript, 1978, p.203
5. Sections 210(1) and 210(2) of the Navigation Act, 1912. Each State has equivalent legislation.
6. Transcript, 1977, p.198

34. The following engineering modifications have been urged by various agencies and authorities to improve the manoeuvrability and thus safety of super-tankers; twin screws, twin rudders, bow thrusters, greater backing power and variable pitch propellers.(7) Many super-tankers have no back-up power source, and should a failure occur, all systems on board would cease to function. Super-tankers, because of their size and weight, are unable to anchor until equipment failures are rectified.

35. Figure 3 shows the major causes of ship casualty for the years 1969-1973.

Figure 3

TANKER ACCIDENTS RESULTING IN OIL OUTFLOW, 1969-73

Tankers over 3000 Dead Weight Tonnes (DWT)

Type of Accident	No. resulting in oil spills	% of involvements	Amount of oil (long tons)	% of spills
Breakdown	11	2	29,940	3
Collision	126	28	185,088	18
Explosion	31	7	94,803	9
Fire	17	4	2,935	0.3
Grounding	123	27	230,806	22
Ramming	56	10	24,656	1
Structural Failure	94	21	339,181	32
Other	4	1	54,911	4
TOTAL	452		951,317	

Source: Lloyds Weekly Casualty Reports

7. Transcript, 1978, p.297

36. The table shows that structural failure was the greatest single source of oil pollution. Although most incidents involved vessels 15 to 20 years old, the age is considered to only be a gross indicator of probability of failure.

Spills from Offshore Drilling Rigs

37. Australian offshore oil-producing rigs have an excellent pollution-free record. In the Australian offshore area over 343 wells have been drilled with no oil blowouts.(8) Although the probability of a major spill from Australian offshore oil and gas operations may be low, if a spill occurred, it could be a major disaster. The possibility always exists of a major oil blowout for which contingency arrangements would be required.

B. DELIBERATE SPILLS

38. Information on intentional discharges from ships is limited, although some information is available through coastal surveillance reports. Much reliance is placed on the offender reporting the spill. This is usually effective for large spills which could be easily traced, but smaller spills, particularly deliberate discharges from tank washings, are not likely to be reported by the offender.

39. The Department of Primary Industry believes that only a small proportion of the oil entering Australian marine waters originates from accidental spills.(9)

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8. Transcript, 1978, p.324
9. Transcript, 1978, pp.628-9

40. It is normal practice to wash the cargo tanks of tankers with seawater, and frequently crude oil tankers discharge these washings overboard. The oil industry has introduced a system known as Load-on-Top (LOT), to reduce the amount of oil entering the sea through tank washing. In this procedure, washings and oily water from ballast are retained on board the ship for settling to concentrate their oil content at the surface, which is then incorporated into the next shipment. It has been estimated (see figure 2) that non-LOT tankers spill more than twice the amount of oil spilt by LOT tankers.

4 METHODS OF PREVENTING SPILLS

41. In the past too much emphasis has been placed on ways of responding to a spill on the assumption that they cannot be prevented. Spills may not be entirely preventable, but the Committee believes that they can be significantly reduced, and raises the following issues as means of reducing the number of spills.

A. TRAINING

42. There are no specific qualifications, service requirements, or mandatory training for oil tanker crews.(1) The Department of Transport said that the need for training courses on safety matters is of such urgency that the Department, in consultation with industry, initiated a number of short courses.(2)

43. The establishment of the Australian Maritime College at Launceston, Tasmania, will make available facilities for training and examination of ships' personnel in correct and safe tanker operating practices.

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1. Transcript, 1977, pp.37, 38
2. Transcript, 1978, p.781

44. The Committee recommends that:

> the Australian Maritime College give priority to the introduction of comprehensive training courses in tanker safety.

45. The relationship between safety precautions and oil pollution prevention is obvious. Draft legislation will soon be introduced to implement the provisions of the 1974 Safety of Life at Sea (SOLAS) Convention. The Committee stresses the importance of Australia's ratification of this Convention.

46. In June 1978 the Inter-governmental Maritime Consultative Organisation (IMCO) held an international conference on Training and Certification of Seafarers to adopt the first International Convention on Training, Certification and Watchkeeping for Seafarers. The Convention will come into force 12 months after being accepted by at least 25 countries owning between them 50% of the world's gross tonnage of merchant shipping. This Convention sets out minimum standards for crews including training, certification and watchkeeping, particularly for navigational, engineering and radio personnel. Control measures will be available to countries which have accepted the Convention, in that ships, while in the ports of an accepting country, may be checked to verify that the officers are properly certificated, and may detain a ship in cases of serious deficiencies.

47. The Convention includes a chapter dealing with special training and qualification requirements for crews on oil, chemical and gas tankers, covering tanker safety, fire safety measures and systems, pollution prevention and control, operational practice and obligations under applicable laws and regulations.

48. The Committee recommends that:

> the Commonwealth Government take immediate steps to enable Australian ratification of the International Convention on Training, Certification and Watchkeeping for Seafarers.

B. PILOTAGE

49. Evidence was taken from the Port Phillip Sea Pilots' Association and the Queensland Coast and Torres Strait Pilot Service. The Committee is convinced that the carriage of a pilot in areas that require detailed local knowledge to enable safe navigation must significantly reduce the risk of an accident. The Committee was told of instances where, if the pilot had kept the ship on the course recommended by the ship's Master on boarding, an inevitable grounding would have occurred.(3)

50. The need for pilots was acknowledged by most witnesses that gave evidence to the Committee, and also by insurance companies. In 1966 a marine inquiry held in Hong Kong after a grounding incident on Clack Reef stated, "The Court does not consider it good practice for a vessel to proceed the full length of the Barrier Reef without the services of a pilot...". As a result of the Court's

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3. Transcript, 1978, p.118

decision, the Master's certificate was suspended for 12 months, and the insurance company refused to pay the claim.(4)

51. Many oil companies have recognised the value in employing pilots to navigate their vessels in difficult areas. The Shell Company of Australia, for example, insists that all their tankers and chartered ships have a pilot through the Barrier Reef north of Cairns.(5)

52. It is evident that unpiloted ships in Torres Strait and the Great Barrier Reef are a hazard to other shipping. The Committee was told that unpiloted ships stay very close to the recommended tracks printed on charts, with little consideration for the needs of other ships in the area, causing a collision potential beyond their actual numbers.(6)

53. Strict adherence to the tracks may create focal points in areas where none need exist. Recommended tracks are printed on navigation charts at the decision of the Royal Australian Navy's Hydrographic Service, an organisation it was claimed with little knowledge of the handling and operation of present day merchant shipping.

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4. Transcript, 1978, p.503
5. Transcript, 1978, p.425
6. Transcript, 1978, p.497

54. The Committee recommends that:

> **the Hydrographic Service of the Royal Australian Navy give consideration to widening the recommended tracks on navigation charts particularly of the *Torres Strait and Great Barrier Reef*, in consultation with the Queensland Coast and Torres Strait Pilot Service.**

55. The Committee is concerned that in areas where pilotage is compulsory, for example Port Phillip and Westernport Bays in Victoria, Masters are able to obtain exemption certificates too easily. Each State currently enforces various limits on the size and draught of vessels where a Master may exercise a pilotage exemption certificate and not use the services of a pilot. These exemptions are granted after a small number of trips in and out of the port, usually three each way. A Master who holds an exemption certificate usually need only complete one passage a year to keep his exemption current.(7) Some oil company ports do not allow exempt Masters to operate into their ports without a pilot.(8)

56. Although one witness from the Deparment of Transport argued that there was no evidence to support compulsory pilotage, the Committee is strongly convinced that in certain circumstances, and for certain types of ships, compulsory pilotage could significantly reduce the threat of shipping accidents and consequent pollution.(9)

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7. Transcript, 1978, p.115
8. Transcript, 1978, p.108
9. Transcript, 1978, p.822

57. The Committee considers that the cost of employing a pilot is not prohibitive. The fee for using the services of a pilot to negotiate the inner route of the Great Barrier Reef is $1,450[10]. For pilotage assistance into Westernport Bay in Victoria it is between $460 and $1,265.[11] Charges are small compared with normal operating costs, and the cost of a potential accident. The Committee is particularly concerned about the inner route in the Great Barrier Reef between Booby Island and Cairns, and the entire Great North-east Channel to Bramble Bay.[12]

58. The Committee therefore recomends that:

> **the Commonwealth Government, at an international as well as national level, encourage the acceptance of compulsory pilotage for all oil tankers and other types of vessels over 10,000 tons in areas where detailed local knowledge is required for safe navigation.**

C. NAVIGATION AIDS

59. The Department of Transport operates and maintains marine navigation aids to serve the needs of shipping. The Commonwealth responsibility for provision of navigation aids ceases at the port boundary,[13] where it becomes the responsibility of State and local authorities.

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10. Transcript, 1978, p.504
11. Transcript, 1978, p.112
12. Transcript, 1978, p.496
13. Transcript, 1977, p.44

60. Australia is a party to the International Convention on the Safety of Life at Sea (SOLAS) which was developed at IMCO in 1960. Chapter 5, Regulation 14 binds contracting Governments:

> to arrange for the establishment and maintenance of such aids to navigation, including radio beacons and electronic aids as, in their opinion, the volume of traffic justifies and the degree of risk requires, and to arrange for information relating to these aids to be made available to all concerned.

61. The coastal navigational aids in service as at June 1978 are:

Manned lightstations	45
Unattended lightstations	223
Lightvessel stations	2
Lighted Buoys	33
Unlighted beacons	24
Decca radionavigation chains	2
Radiobeacons	10
Telemetric tide gauge	1

62. The Department of Transport makes its judgment on the operational requirements for navigation aids in the areas for which it is responsible. It does so on the advice of both its own specialised personnel and shipping interests.

63. Although the navigational aids currently provided are generally regarded as adequate, there is room for improvement. The Torres Strait and Port Hedland areas were indicated as requiring particular attention.(14)

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14. Transcript, 1978, p.683

64. The Queensland Coast and Torres Strait Pilot Service has advised the Department of Transport of suggested priorities in the provision of navigational aids. In a reply dated December 1973, the Department stated that it would "proceed to implement the proposals taking note of the Pilot Service priorities".(15) To date little progress has been made on installation of the recommended navigation aids.

65. The Pilot Service said there was a need for an additional telemetric tide gauge in the Prince of Wales Channel. The Department of Transport advised the Committee that action is underway to provide two more telemetric tide gauges in the Torres Strait within the next two years.(16) The Committee notes that the Department is moving towards improving navigation aids in hazardous areas, but is concerned at the time delays in installation.

66. Accordingly, the Committee recommends that:

> **the Minister for Transport review, as a matter of urgency, the provision of navigation aids in hazardous areas, with particular reference to the addition of two telemetric gauges in the Torres Strait.**

67. Defective Equipment. State and Commonwealth authorities may be unaware of the poor standard of equipment, particularly navigation aids, on many ships using Australian waters. A representative of the Queensland Coast and Torres Strait Pilot Service claimed that approximately 40% of the ships he pilots have substandard equipment. He went on to

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15. Transcript, 1978, pp.509-510
16. Transcript, 1978, p.824

say, "a very large percentage of ships afloat today under flags of convenience have absolutely appalling standards both in trained navigating personnel and in equipment."[17]

68. The Committee recommends that:

- **the Department of Transport investigate, and report to the Minister on possible ways of reporting suspect shipping.**

- **the Department of Transport compile an official register of ships failing to meet adequate equipment and safety standards for use by harbour authorities in routine inspections.**

69. It was suggested to the Committee that legislation be enacted to require a certain minimum standard of navigational equipment.[18] This is not practical in terms of the retaliatory sanctions that may follow. The Committee would prefer that international conventions be used to improve standards. More frequent inspections of equipment and safety requirements should be made.

70. The register of shipping prepared by the Department of Transport recommended above could be used to detain and survey a ship under Sections 210(1) and 210(2) of the Navigation Act 1912.

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17. Transcript, 1978, pp.513-5
18. Transcript, 1978, p.10

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D. ADEQUACY OF NAVIGATION CHARTS

71. Hydrography is the gathering of information to enable preparation of nautical charts to permit safe navigation of shipping. Charts are based on the collection of data dealing with depth, position, tidal streams, effects of tides, currents, and to a lesser degree with meteorological effects, and nature of the bottom surfaces. It is extremely expensive in terms of manpower and resources.

72. Charts of the Australian coastal waters are based on information gathered as far back as 1798. The quality of charts depends on the amount of resurveying work that has gone on in a particular area. Charts for shipping routes in the Torres Strait - Great Barrier Reef area are generally based on data gathered since 1944. Further advances which have increased the accuracy of navigation charts include the introduction of side-scan sonar.

73. The Defence Research Laboratory at Salisbury, S.A. has developed an airborne laser echo sounder for the Royal Australian Navy Hydrographic Service. With clear water conditions, profiles of the ocean bottom down to depths of 40 metres may be obtained. During 1977, trials of the system were conducted in S.A. waters, the Great Barrier Reef and Torres Strait with promising results. It is expected that the system will be operational by 1981.(19)

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19. Transcript, 1978, p.622

74. The need for effective and accurate navigation charts was highlighted in 1970 when the Oceanic Grandeur hit a rock in Torres Strait that had been inaccurately charted. The Committee was concerned to learn that instances of ships touching bottom on unchartered shoals in the Great Barrier Reef were not rare[20] and contain the elements of disaster. Such incidents are usually reported to the Department of Transport, and the marine community is alerted. This is one means, although an unacceptable one, of improving charts in the area. It was also indicated that it is likely that many ships do not report incidents of touching bottom[21] thus transgressing normal 'seamanlike' rules.

75. Only 35% of Australian coastal waters are adequately, or temporarily adequately,[22] surveyed. The remaining 65% is unsurveyed. The need for additional survey work is becoming more critical as the size of shipping increases.

76. The Royal Australian Navy's Hydrographer stressed to the Committee the need to improve the quality of charts currently available. He went on to say that, "Although Australia's hydrographic surveying service has a firm technological base and an ongoing program of equipment modernisation, such programs are constantly under threat of deferment or cancellation due to limitations on financial

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20. Transcript, 1978, p.604
21. Transcript, 1978, p.605
22. An adequate survey is defined as a survey line spacing of less than 125 metres. A temporarily adequate survey has line spacing of between 125 and 250 metres.

resources."[23] The Committee considers that the cost of upgrading navigation charts is a small price to pay compared with the threat of a major grounding incident.

77. The Committee recommends that:

> **the Commonwealth Government increase the funds available for hydrographic work in Australian coastal waters to hasten the upgrading of navigation charts.**

E. *TRAFFIC MANAGEMENT*

78. Whilst navigation aids ensure that a ship can be navigated safely, they do not ensure safe passage in dense traffic. *There is a need to provide traffic management* schemes in these areas.

79. Within ports and harbours and their approaches, where traffic is comparatively dense, it has been the practice to mark navigational channels so that ships proceeding in different directions can keep clear of each other. More sophisticated systems of harbour control are being progressively introduced involving VHF communications and radar surveillance.

80. The idea of separating shipping routes in relatively open waters has been more recently introduced and IMCO now promulgates information about approved schemes for the observance of ships from all countries. The latest

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23. Letter to Committee from Naval Hydrographer dated 23 August 1978.

collision prevention regulations which came into force internationally in July 1977, require compliance with approved traffic separation schemes.[24]

81. Ships' Masters require as much navigational freedom as possible to enable avoidance of bad weather and to exercise professional skills in gaining advantage from such things as surface currents. Mandatory traffic separation is therefore limited to confined areas where traffic density is relatively heavy.

82. The busiest shipping route in Australian waters is in Bass Strait, off Wilsons Promontory, with an average traffic density of 12 ships per day. In contrast, the Dover Straits off the United Kingdom, averages some 300 transits and 70 crossings per day, and is probably the busiest shipping route in the world. The level of risk associated with navigation off Wilsons Promontory, taking into account the poor visibility conditions encountered in winter months, was judged sufficient to justify a traffic separation scheme which was introduced in 1969. The scheme has the endorsement of IMCO. Although the Wilsons Promontory scheme is the only one which has been formally declared off the Australian coast, the Department of Transport has recommended navigational procedures to be followed in the approach channel outside the port limits of Port Hedland.[25]

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24. Transcript, 1977, p.55
25. Transcript, 1977, p.54

83. Shipping traffic in Torres Strait and in the northern Great Barrier Reef waters is also being studied. There is insufficient width of deep water to establish two tracks in some areas, so any traffic separation scheme that is established will probably be longitudinal rather than lateral.

84. The restricted area around the platforms in Bass Strait is another example of traffic management. Under Section 119 of the Petroleum (Submerged Lands) Act 1967, provision is made for the declaration of a safety zone extending a distance of 500 metres around a platform structure. This provision is in accordance with Article 5 of the *International Convention on the Continental Shelf, 1958.*

85. Ships have occasionally sailed between oil rigs to the concern of the operators. In addition to the legislated *prohibited zone, a cautionary notice and associated chart* have been issued by the Department of Transport to shipping using Bass Strait which identifies a restricted area of 2.5 nautical miles. This limit is not imposed by law and if a ship contravenes the zone, no offence has been committed. The Committee is concerned that the only restricted zone around rigs enforceable by law is 500 metres. Although the Committee would prefer to see the restricted zone increased under the Petroleum (Submerged Lands) Act 1967, it is realised that this move is inappropriate at the present time, whilst international discussions are continuing on the Law of the Sea Convention.

86. The Committee recommends that:

> **the Commonwealth Government make representations at an international level to have the restricted zones around Australian *offshore oil platforms extended* to a distance of 2.5 nautical miles.**

F. SURVEILLANCE

87. An integral part in the protection of Australia's coastline and marine environment is the surveillance and monitoring of oil pollution. The effectiveness of protective measures depends directly on the capacity of the coastal surveillance system. The existing task is extremely difficult in view of Australia's long coastline and limited resources. Surveillance will become more difficult in the future with the extension of the area of Australian responsibility to 200 nautical miles.

88. At present routine coastal surveillance operations are planned and co-ordinated by a 3 tiered organisation, consisting of a Standing Committee of the relevant Commonwealth Departments chaired by Department of Transport, a subordinate Working Committee and the Department of Transport Australian Coastal Surveillance Centre, (previously the Marine Operations Centre). Some of the tasks performed by the coastal surveillance network include the reporting of oil slicks, obtaining samples of oil by surface craft where possible, and reporting any vessels either causing the pollution or in the vicinity which may be the source of the pollution.(26) The interdepartmental committee co-ordinating the surveillance network has produced a coastal surveillance manual distributed to all military and merchant shipping and aircraft, which contains instructions on the reporting of pollution.(27)

89. The Department of Environment, Housing and Community Development told the Committee that the present coastal surveillance system is not effective in reporting oil

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26. Transcript, 1977, pp.224-225
27. Transcript, 1977, p.439

spills. "The very nature of our coastal surveillance systems is such that a very large percentage of the recent reports of oil slicks have come from ... commercial ships and aircraft. Very few come for our surveillance reports."(28)

90. The Committee appreciates the problems involved in establishing an adequate surveillance system in Australian waters. Althought the effectiveness of current surveillance procedures is hampered by a lack of resources, the Committee is not convinced that the enormous cost required to significantly upgrade the system is warranted. The Committee has noted the potential of satellite imagery to enhance the surveillance network. Recent studies undertaken by US Government agencies have verified that satellites have the capability, under certain conditions, to detect oil spills, guide clean-up operations and to detect natural oil seeps.(29)

91. The Committee recommends that:

> **the Minister for Science assess the use of satellites in the field of detection and monitoring of oil spills to determine their suitability for incorporation in the Australian surveillance network.**

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28. Transcript, 1978, p.894
29. Transcript, 1977, p.408

G. ANALYSIS OF OIL

92. Recent technological developments have led to improved methods of identifying the sources of oil pollution. An efficient system of 'oil matching' is available through the use of gas chromatography. The basis of the system involves a molecular comparison of oil samples. The system has been successfully used in prosecutions in N.S.W.[30] but a major drawback is that the process can only be used for identifying types of oil; it cannot be used to show that oil came from a specific ship.

93. The Committee realises that the ability to efficiently match samples of oil pollution with vessels of origin could lead to a marked decrease in deliberate ship-sourced pollution.

94. Various methods for individually 'fingerprinting' oil cargoes have been considered. Sweden has introduced a trial system of coded plastic pellets which are put into unladen or ballasted tankers. Tank washings from these vessels can then be easily traced. The Committee was told that this has resulted in a significant reduction in oil spills.

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30. Transcript, 1978, p.256

95. Although Australia does not suffer significantly from pollution arising from tank washings as few tankers operate on the Australian coast in ballast, the Committee considers a cargo-tagging program similar to that operating in Sweden has definite benefits.

96. The Committee recommends that:

> **the Department of Science, in conjunction with the Department of Transport, assess the feasibility of introducing cargo-tagging programs with a view to introducing such a system to Australia.**

H. OIL RECORD BOOKS

97. Vessels carrying oil cargoes are, by law, required to keep records of oil and ballast transfers.(31) The effectiveness of such records in monitoring the oil content of ballast, especially in modern tankers, was commented on by the Department of Transport.(32) Existing procedures employed are considered to be adequate. The Committee looks forward to the development and introduction of on-board monitoring equipment as envisaged in the 1973 IMCO Pollution Convention.

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31. N.S.W. Prevention of Oil Pollution of Navigable Waters Act 1962 S.10, Vic. Navigable Waters (Oil Pollution) Act 1960 S.10
32. Transcript, 1977, p.154

I. PENALTIES

98. The imposition of fines is an effective means of reducing both deliberate and accidental oil spills. Each State has legislation providing penalties for discharge of oil. For example, in N.S.W. the maximum penalty for oil discharge is $50,000, with an additional maximum penalty of $10,000 for failure to inform the Maritime Services Board of all details of an incident. Similarly, in Victoria the maximum penalty under the Navigable Waters (Oil Pollution) Act 1960 is also $50,000. The penalty was raised from $2,000 to $50,000 in January 1973.

99. It is rare to see heavy fines imposed. In Brisbane on 19 June 1978, Ampol was fined $5,000 for allowing oil to escape from a storage tank into the Brisbane River, when the maximum fine is $50,000. In Victoria on 14 June 1978, the Chief Officer of a tanker was fined $1,000 for discharging oil into the Port of Melbourne. In 1976, for all Victoria, 23 fines were imposed, totalling $10,200, with a maximum of $1,500 for one incident.(33)

100. In May 1978, in N.S.W., the Supreme Court imposed a fine of $10,000 on the Master of the Stolt Sheaf, the highest fine ever for N.S.W. Mr Justice Slattery, in summing up, was reported as saying, "I am nevertheless satisfied that extensive pollution cannot be regarded lightly". The Court decided that the discharge of oil was "sufficiently serious to merit a very solid deterrent fine".(34) The fine imposed was only 20% of the maximum penalty.

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33. Transcript, 1978, p.62
34. Transcript, 1978, p.244

101. Industry representatives told the Committee that the size of any fine was only of secondary importance compared with clean-up costs. They stressed that, to protect their image as a pollution-conscious industry, many pollution control measures have already been introduced.(35) Although pleased to see the oil industry taking voluntary action to prevent oil spills, the Committee is concerned that fines are regarded lightly. It is considered that until fines are high enough to have a significant impact on offenders, they will have little effect in reducing the incidence of spills.

102. Heavy fines should be imposed when a spill is accidental as well as for deliberate spills. If accidents occur due to human error and a heavy fine is incurred by the responsible company, more consideration will be given to stressing the importance of spill avoidance. Fines in these instances may result in more and better training programs for the on-the-job operators.

103. The Committee was particularly interested in the American system of using fines that are imposed for marine oil pollution offences to finance national contingency plans. Present jurisdictional arrangements prevent the Committee recommending along these lines for the Australian situation.

104. The Committee recommends that:

> **the Commonwealth Government encourage State Governments to amend their legislation to increase penalties for oil pollution of the sea.**

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35. Transcript, 1978, p.364

J. SHORE-BASED FACILITIES

105. The Committee is concerned by the lack of facilities provided at major ports to receive oily wastes. It was pointed out that one of the major problems of pollution control experienced by the Royal Australian Navy, is the "general lack of facilities in ports for the collection and disposal of oil sludge".(36)

106. It is considered that the provision of adequate facilities in all major ports in Australia for ships to pump oil sullage ashore for separation would go some way to reducing the incidence of deliberate oil pollution at sea.

107. The Committee notes that on 1 January 1978, the Department of Transport began a full-scale survey of facilities in ports to receive wastes from ships to determine the type and size of facilities required. Final figures will not be available until mid-1979, and it will clearly be some time after that before construction is commenced. The Committee welcomes the investigations into provision of these facilities, but is concerned that it will be some years before they will be operational.

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36. Transcript, 1977, p.427

5 CLEAN-UP OF OIL SPILLS

A. NATURAL BREAK-DOWN OF OIL

108. Oil entering the marine environment is subject to various physical and chemical processes which modify oil slicks creating tar lumps and dispersing the oil throughout the water column, sediments and the atmosphere. Oil is also transformed by biological action which includes microbial attack, and ingestion by larger organisms. As the oil ages physical processes play a minor role in the weathering process compared with the slower chemical and biological processes, which continue to modify the oil long after many physical processes have ceased.

109. The rate of spread of an oil slick is determined by a number of factors such as the physical and chemical properties of the oil, temperature, wind, current and wave force. As the oil spreads, there is an increase in the surface-to-volume ratio of the spill which results in a greater exposure to the atmosphere, sea and sunlight. At this stage evaporation is the predominant dispersal force, acting on volatile oil components. The most toxic hydrocarbons are the first to evaporate. Other forces acting at this stage include emulsification and sedimentation. Dissolution is probably not a major factor in oil spill break-down, as the most soluble hydrocarbons are generally those which are readily evaporated.

110. Once the lighter components of the oil have been lost by evaporation, biological processes play a much larger part in further break-down of the oil, leaving a dense and viscous residue. Once this residue has consolidated into tarry globules, further weathering is extremely slow. These tar balls are persistent and are frequently washed up on beaches.

111. Experiments in temperate waters have shown that after 2 to 5 months about 25% of the weathered oil is broken down by micro-organisms and that this process continues but very slowly.(1) Oil may settle in sediments, where extremely slow break-down leads to the persistence of toxic components for long periods. Figure 4 provides a timescale of the processes which may affect an oil spill.

112. Under the National Plan to Combat Pollution of the Sea by Oil (National Plan) oil spills are monitored and if no major environmental damage is likely to occur, the oil is allowed to disperse naturally. If, however, significant environmental areas are under threat, intervention to remove the oil or to accelerate the process of degradation may be necessary.

B. METHODS OF INTERVENTION

Mechanical Retrieval at Sea

113. Mechanical retrieval is the most environmentally acceptable method of dealing with oil pollution in that:

- removal of the oil avoids the possibility of further environmental damage;
- mechanical recovery devices do not in themselves cause any ecological damage;
- recovered oil may have a commercial value.(2)

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1. U.K. Department of the Environment Accidental Oil Pollution of the Sea, Pollution Paper No. 8., H.M.S.O. 1976, p.76
2. Accidental Oil Pollution of the Sea p.88, Transcript, 1978, p.27

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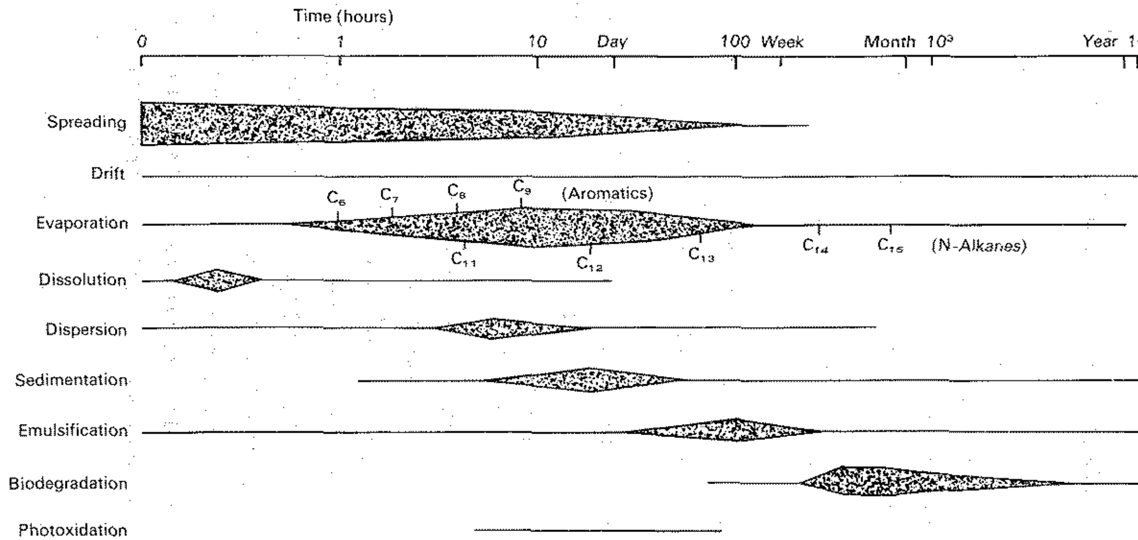
Figure 4: Processes v. time elapsed since spill



Line length—Probable time span of any process.

Line width—Relative magnitude of the process, both through time and in relation to other contemporary processes.

Source: C.B. Koons, R.B. Wheeler, *Inputs, fate and effects of petroleum on off-shore Norwegian waters*, Basin Exploration Division, Exxon Production Research Company, Special Report, September 1977, p. 9.

114. To control an oil spill effectively the rapid deployment of a boom is essential to limit spreading and to concentrate the oil while skimmers are used to remove the oil from the water.

115. There are several ways of removing oil from water. These include:

- adhesive surfaces;
- continuous belts;
- centrifugal devices;
- weirs; and
- absorbent chips.(3)

116. In practice existing recovery equipment suffers from one or more of the following disadvantages:

- they cannot be used in all circumstances;
- the need for trained operators and ancillary equipment; and
- the high capital cost.(4)

To operate recovery equipment effectively nearly calm sea conditions and a current movement of less than 0.7 knots is required. In current speeds above this level, oil is carried under the boom by the headwave created on the upstream side of the boom, regardless of the depth of the boom. If conditions are rough, large quantities of water are included in the recovered liquid and immediate storage and separating problems result. Wave action prevents containment of the oil within the boom, and recovery devices are not effective.

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3. Exhibit No. 3
4. Accidental Oil Pollution of the Sea, p.91

Recovery devices which are more effective in open sea conditions are expensive and are too large to be readily transportable.[5]

Dispersal

117. The term dispersant includes all chemical products which may be described as detergents, emulsifying agents or solvent emulsifiers. These substances are designed to promote the formation of an oil-in-water emulsion when sufficient mixing is provided. The emulsion tends to be dispersed through the sea, by currents and turbulence.[6] The dispersants themselves do not destroy the oil but enhance the natural processes of degradation by breaking up the oil and creating a larger surface area on which natural processes may operate.

118. The use of dispersants has a number of advantages. Stockpiling of dispersants makes possible a state of constant readiness for dealing with any oil spill. Dispersants are easily stored and transported, and the initial capital outlay is comparatively low. Dispersant application/agitation systems are simple to operate and can be used from existing craft in open sea conditions which preclude the use of physical recovery methods. Additionally the hazard to birdlife is reduced, fire hazards are decreased and there is a lessening of nuisance effects.[7]

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5. Transcript, 1977, p.73
6. Exhibit No. 3
7. Exhibit No. 3

119. Toxic Effects of Dispersants. It is acknowledged that dispersants are toxic to marine biota and must be used with care. Since the time of the Torrey Canyon dispersant manufacturers have developed dispersants which are on average about 1000 times less toxic than those used previously.(8) Dispersants available in the late 1960's had an acute toxicity rating of 10 parts per million (ppm). By contrast the products now available commercially have acute toxicities which range from 3000 ppm to 11,000 ppm.(9)

120. In addition to the inherently toxic effects of the dispersants themselves, environmental damage may result from *increased toxicity of oil arising from the use of* dispersants. Dispersants cause the oil to spread through the water column increasing the chance that aquatic organisms will come into contact with the toxic compounds in solution.(10) In oceanic or deep water areas these effects will not be significant as the volume of the oil-dispersant mixture, compared with the volume of water will be small. Conversely in shallow waters or areas where little water movement occurs, this effect becomes increasingly potent.

Other Methods of Treating Oil at Sea

121. Sinking. This involves the distribution of a dense material over the oil to carry it to the bottom. This method of treating oil is relatively cheap, although there are distinct drawbacks to any sinking method. In coastal areas damage to fisheries is likely, the oil may harm the bottom fauna, or it may foul fishing nets and catches. For these

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8. Transcript, 1977, p.76
9. Transcript, 1978, p.129
10. Transcript, 1978, pp.18-49
    Transcript, 1977, pp.422-423

reasons it is not recommended in heavily fished areas. The oil may also be released periodically or in shallow waters it may be carried ashore to cause further pollution.

122. Burning. Except in limited circumstances, attempts to burn oil at sea are rarely successful. The oil must be fresh and the slick thick and continuous. To facilitate burning, wicking agents have been used, but it is still often difficult if not impossible to set fire to slicks. If feasible, burning could be rapid with little or no harm to marine life, but the resultant air pollution, fire hazard (particularly if ships or offshore structures are involved), and the difficulty of removing unburnt residues, makes the technique undesirable.(11)

C. FACTORS AFFECTING THE CHOICE OF ACTION

123. While the primary factor to be considered in the treatment of an oil spill is its location, rate and direction of drift and the possible damage it may cause, the following factors also have a bearing on the treatment strategy to be adopted.

Meteorological Conditions

124. Storms and rough seas may preclude recovery or dispersal. Some skimmers and booms can operate in seas up to force 5 (fresh breeze, 17 to 21 knots, moderate waves about 2 metres in height). Artificial dispersal can be undertaken in force 6 sea conditions (strong breeze, moderate waves, to about 3 metres in height). In worse sea conditions the oil

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11. Accidental Oil Pollution of the Sea, pp.90-101

is emulsified and dispersed by the wind and waves. Winds move the oil over the water at about 3% of wind velocity and may drive it ashore. Winds also break oil up and cause it to form windrows.

Sea Conditions

125. Oceanographic variables, including currents, tides and depth of water, affect the movement of oil on water and thus the choice of action.

Properties of the Oil

126. The properties of oil may limit the effectiveness of artificial dispersal and sometimes mechanical retrieval. Viscous crudes and refined products are difficult to disperse effectively without using dispersants with highly toxic solvents. Mechanical recovery equipment can only recover oil with moderate viscosity.

127. If a less viscous oil is to be dispersed effectively, it needs to be treated before it weathers and viscosity increases. Once oil has weathered for 24 hours dispersal or mechanical recovery by a skimmer can be difficult.(12) Evidence received by the Committee states that the skimmers currently available are not able to cope with weathered Bass Strait crude oil.(13)

Existing Environmental Stress

128. The occurrence of an oil spill in near-shore waters of harbours and bays adjacent to population centres, adds to the existing pollution and ecological stress. In these locations care is required to ensure action taken avoids increased damage to the environment.

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12. Transcript, 1977, pp.241-2
13. Transcript, 1978, p.80

Availability of Equipment and Trained Personnel

129. In Australia the majority of equipment and trained personnel are located at the major ports. When an oil spill occurs at some distance from these centres, the treatment strategy adopted may to some extent be determined by the type of equipment which can be transported to the scene in time to be effective.