CHAPTER 9

CRITICISMS OF CURRENT PLANS - PART I

FORMAT OF PLANS

Introduction

9.1 Many submissions criticised the detail of current contingency plans for the accidental release of ionising radiation from a visiting nuclear powered warship. Much of the criticism, however, was inconsistent with the reference accident upon which the plans are based. The Committee found it unnecessary to deal with this category of criticism because the Committee has concluded that the current reference accident is an appropriate basis for planning.

9.2 This chapter and chapter 10 deal with the arguments put to the Committee that, even if the reference accident is an appropriate basis, the plans for Australian ports based on it are nonetheless deficient in one or more respects. The port plans examined were those for Gage Roads/Cockburn Sound in Western Australia, Brisbane, Darwin, and Hobart.[1] Plans for other ports, to the extent that plans exist, were not examined in detail because the ports do not currently receive visits.

Same Standard as for Non-Nuclear Accident Planning

9.3 Contingency plans for a reactor accident aboard a visiting warship will have to be designed to deal with the unique

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1. See paras. 2.36, 2.37, 2.39, 2.41 and 2.42 for the full titles, dates, etc of these plans.

features of reactor accidents. One point of comparison for the Committee in evaluating the Australian plans was overseas planning for reactor accidents.[2]

9.4 A second possible point of comparison was planning for non-nuclear accidents. A conspicuous omission in submissions criticising the detail of the plans under examination was any attempt to substantiate the criticism by reference to plans relating to other, non-nuclear, contingencies. By inference, it was suggested that the plans subject to the Committee's inquiry should conform to different standards from plans for other accidents or for natural disasters.

9.5 The Committee considers that in principle there is no reason why this should be so. Matters such the degree of detail and complexity in plans; the scale and frequency of exercises; the degree of public participation in exercises; the public availability of plans; and publicity measures regarding the content of plans and actions to be taken by the public if the accident occurred should be guided by the experience gained from planning for other types of accidents and emergencies. The Committee takes the view that the same general criteria should apply to both nuclear and non-nuclear accident contingency planning.

Degree of Detail Required

9.6 Senator Vallentine described the WA Port Safety Scheme as 'not a safety scheme at all, but rather a huge rendez-vous plan'.[3] The Committee, without accepting this as an accurate description of the particular plan, acknowledged that the comment

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2. For a general checklist on what should be contained in a plan to deal with a reactor accident see International Atomic Energy Agency, Basic Safety Standards for Radiation Protection, (1982 edn., IAEA, Vienna), para. A.IV.614.
3. Submission from Senator J. Vallentine, p. 10 (Evidence, p. 1053).

raised a general issue. This was the extent to which plans should be expected to go beyond ensuring that appropriate experts are present at appropriate locations, and should state in any detail what the experts are supposed to do.

9.7 The distinction can be made clearer by use of a simplified example relating to post-accident responses in Zone 2. One possibility is that the plan is required to do no more than provide that suitably equipped monitoring groups are present with appropriate communication links established, and state that the implementation of any countermeasures would be made on the advice of these groups. A second approach would have the plan state how the groups should go about monitoring, where they should take readings, how often, with what equipment, what the consequences of any particular level of readings should be in terms of counter-measures, and so forth.

9.8 Clearly if the first approach is adopted there must be a sound basis for thinking that the personnel have the necessary expertise and that the sorts of things that they are being asked to do are practicable. But the basis for this does not have to be in the plan itself. The Committee saw the issue, in effect, as being whether a port safety plan was required to be a comprehensive, free-standing document, or whether it could be something less than this. The Committee accepted the latter as more appropriate.

9.9 The Committee has identified specific problems in the plans. But it has done so only after reading them in the light of information contained in other, Commonwealth, documents. Allowance has also been made for the expertise of those required to act under the plans. To return to the example just given, a radiation expert equipped with the information set out in the

monitoring handbook[4] and the monitoring guidelines[5] does not, in the Committee's view, need specific direction from a port safety plan. It is enough that the plan links the expert's presence into other elements of the plan.[6]

9.10 One consequence of adoption of this view is that the Committee does not consider that port safety plans should be written so as to serve a general educational or informative role. The plans need only to be operational guides for those expected to implement them. It is not a valid ground of complaint, in the Committee's opinion, that the plans for specific ports fail to provide all the detail and background information a lay reader might wish. Educational needs can be addressed in ways other than by requiring voluminous safety plans.[7]

Style and Length of Plans

9.11 One submission described the WA Port Safety Scheme as 'lengthy, repetitious and tedious - and thus confusing, which a report on such an important matter has no right to be'.[8] As to the Scheme being tedious, the Committee leaves it for readers to decide. It merely notes that it does not consider that safety plans should provide exciting reading.

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4. ANSTO, Radiation Monitoring Handbook for Visits by Nuclear Powered Warships to Australian Ports, (ANSTO, Lucas Heights, NSW, 1985).
5. Department of Defence, Environmental Radiation Monitoring during Visits of Nuclear Powered Warships to Australian Ports: Requirements, Arrangements and Procedures, (May 1988).
6. See also Evidence, p. 1300.46 (Department of Defence):
   > While port safety plans for NPW visits allocate responsibilities to the appropriate authorities, they allow that those authorities are competent to implement the most appropriate procedures ... .
7. See paras 8.89-8.93.
8. Submission from Scientists Against Nuclear Arms (WA) and Medical Association for the Prevention of War (WA), p. 2 (Evidence, p. 788), See also the submission from People for Nuclear Disarmament, p. 5 (Evidence, p. 1307): the WA plan 'is difficult to read and does not have the clear, easy to follow procedural advice necessary for an emergency document'. No examples of difficult passages are given to support this view, nor is it explained why the step-by-step procedures set out in parts 3-5 of the plan are not easy to follow.

9.12 The Committee does not consider that Australian contingency plans are excessively lengthy. The WA Port Safety Scheme is a few pages longer than the 57 pages of the corresponding British plan for Liverpool.[9] Unlike the Liverpool plan, however, the WA plan deals with two locations, Gage Roads and Cockburn Sound, and with two classes of vessel, those having reactors rated at more than 100 Mw(t) and others with smaller reactors. The British plan for the naval dockyard at Devonport is nearly 40 pages longer that the WA plan.[10]

9.13 In response to a question from the Committee, the Department of Defence stated:

> In comparison with other types of emergency plans, the WA port safety plan is more complex than some (eg cyclone response plans) and less complex than others (eg HAZMAT plans).[11]

The Committee noted that the WA plan is, for example, only a few pages longer than the Australian Capital Territory disaster plan.[12]

9.14 The particular evidence cited for the claim of repetition is the overlap between Parts 3, 4 and 5 of the WA Port Safety Scheme.[13] These parts respectively set out the standing procedures for visits to HMAS STIRLING, for visits to Gage Roads anchorages by vessels having reactors smaller than 100 Mw(t), and for visits by vessels with larger reactors. While there is consi-

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9. UK, Ministry of Defence, Liverpool Special Safety Scheme for Visits to Liverpool by Nuclear Powered Submarines, (April 1986).
10. UK, Ministry of Defence, Devonport Public Safety Scheme, (1982 edn.).
11. Evidence, p. 1300.46 (Department of Defence). HAZMAT plans deal with accidents involving hazardous materials such as chemicals.
12. Department of Territories and Local Government, ACT Disasters Plan, (AGPS, Canberra, 1984). If its sub-plan is taken into account, the ACT plan is considerably longer than the WA Port Safety Scheme: see Department of Territories, ACT Welfare Plan : Sub-plan of the ACT Disaster Plan, (AGPS, Canberra, 1986).
13. Submission from Scientists Against Nuclear Arms (WA) and Medical Association for the Prevention of War (WA), p. 2 (Evidence, p. 788).

derable duplication in this approach, the Committee recognises that this has operational advantages. The accident, if it occurs, will require only one of the three Parts to be acted upon. The Part acted upon will be free of irrelevant references to matters which apply only to other locations or another class of vessel.[14]

9.15 Senator Vallentine questioned what she saw as the complexity of the WA Port Safety Scheme:

> While meticulous in designating each agency's responsibilities, the plan raises numerous questions about whether anything so complicated could work as a coordinated whole at a time when demarcation disputes could spell tragedy.[15]

9.16 During a visit to Western Australia, members of the Committee put this type of criticism to State Emergency Service officials. The Committee members were told that experience from exercises had shown that the scheme was not too complicated. It worked well, and the command structure was very clear.[16]

9.17 Based on this response, and on comparisons with other port safety plans[17] and other emergency plans, the Committee does not consider the WA Port Safety Scheme to be complicated in a way

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14. To some extent, a similar explanation applies to the considerable duplication that exists between the various parts of the Hobart Safety Scheme. The intention appears to be that those required to operate a particular part or sub-part of the scheme need only direct their attention to that part. The evacuation plan (Chapter 14), for example, has been written as a stand-alone plan. As a result it contains much information that is also contained in other parts of the scheme.
15. Submission from Senator J. Vallentine, pp. 10-11 (Evidence, pp. 1053-54).
16. Information supplied at briefing to Committee members by WA officials, 1 February 1988.
17. e.g. UK, Ministry of Defence, Liverpool Special Safety Scheme for Visits to Liverpool by Nuclear Powered Submarines, (April 1986), Annex 3B, lists 17 'authorities responsible for public safety' in relation to the plan. The WA Port Safety Scheme, table of contents, p. vi, lists 16 authorities as having responsibilities under the plan. While the comparison can be no more than approximate due to differing government structures, it indicates that the number of organisations involved in the WA plan is not unusually large.

that would hinder its effective implementation.

Relationship to Other Documents

9.18 The Committee noted that the Parts 9 and 10 of the WA Port Safety Scheme contain mostly background information. There is some duplication as between Part 9 and Part 10.[18] The Parts taken together largely duplicate information provided in other, Commonwealth Government, documents. Some economy of effort could be achieved if the Scheme simply incorporated the relevant extracts from these other documents, perhaps as an appendix.

9.19 In addition to achieving economies, this would ensure that the content of the Scheme does not inadvertently diverge from that of Commonwealth Government documents. For example, the author of Part 10 of the Scheme drew heavily on the original (ie. 1981) edition of OPSMAN 1. Later editions of OPSMAN 1 have been produced and minor discrepancies now exist between the Commonwealth and Western Australian background information.[19]

9.20 Duplication leading to divergence is not limited to the WA Port Safety Scheme. For example, the plans for Brisbane, Darwin, Hobart and Western Australia all contain descriptions of the general hazards due to reactor accidents. The descriptions

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18. e.g. the purposes of radiation monitoring are described in para. 908 and again, in different words, in paras. 1007 and 1011.
19. For example, the WA Port Safety Scheme, p. 10A-6 duplicates OPSMAN 1 (original edition, 1981), Chapter 3, Annex E, Appendix 1, para. 2.4 in setting out three countermeasures that could be taken following an accident. OPSMAN 1 (2nd edn.), para. 121 lists four countermeasures: sheltering is the additional one. The WA Port Safety Scheme itself lists four, including sheltering, at p. 9-4. For a further discrepancy, relating to the effectiveness of gamma radiation monitoring equipment, see chapter 8 footnote 102. In the Hobart Safety Scheme, Chapter 4 and its Annex A duplicate to a considerable extent the content of the Commonwealth's document setting out radiation monitoring requirements, arrangements, etc. They are based on the 1986 edition of the Commonwealth document, and the same potential as with the WA Port Safety Scheme exists for discrepancies to occur as the document is updated. In May 1988 the Commonwealth issued an updated version of the document, although the changes are only minor.

give about 100 metres as the limit of the severe hazard due to gamma radiation through the hull of the vessel following a reactor accident.[20] Commonwealth documentation states the limit as being 30 metres.[21] Again, the Committee considers that incorporation of a Commonwealth document containing background information of this sort is the appropriate solution.

9.21 The Committee RECOMMENDS that the Commonwealth Government produce a document containing all the necessary scientific background on naval nuclear reactors; the nature of the potential hazards resulting from accidents involving the reactors which the plans have to address; and other background information which is common to all the plans. The document should be suitable for incorporation in, or attachment to, individual port safety plans.

Lack of Standard Format

9.22 The current plans for Australian ports are not identical in format, or in their detailed provisions. The Department of Defence has taken the view that a standard format for such plans is not feasible, because of the differing State and Territory legislation under which the organisations responsible for accident response operate.[22]

9.23 The Committee accepts that the plans should reflect uniform objectives, and that, in the abstract, there is much to be said for attempting to achieve these goals through uniform format and content. However, the Committee acknowledges the

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20. Paras. 109, 305, 404 and 903 respectively. Para. 1406 of the Hobart Safety Scheme states that gamma radiation 'could present a hazard close to (say within 200 metres of) the vessel' (emphasis added). If this is intended to refer to gamma radiation through the hull, it is inconsistent with the 100-metre distance given in para. 305 of the scheme.
21. Australia, Environmental Considerations of Visits of Nuclear Powered Warships to Australia, (May 1976), para. 39 (Evidence, p. 134); ANSTO, Radiation Monitoring Handbook for Visits by Nuclear Powered Warships to Australian Ports, (ANSTO, Lucas Heights, NSW, 1985), p. 4 (Evidence, p. 298).
22. OPSMAN 1 (2nd edn.), para. 446 (Evidence, p. 81).

practical difficulties involved in attempting to impose either a uniform format or uniform detailed contents, except in relation to background information on the hazards of radiation accidents, and matters where the Commonwealth has the responsibility for a particular response measure. It became clear to members of the Committee during inspection visits to Western Australia and Hobart that planned responses to a naval reactor accident would draw considerably on procedures, organisational structures and personnel used for the responses to other types of accidents.

9.24 In the Committee's view, an effective response to a naval reactor accident is obtained by having the plan conform where possible to locally accepted ways of responding to emergencies.

PROTECTIVE MEASURES FOLLOWING AN ACCIDENT

9.25 One protective measure that may be taken following a marine reactor accident is to move the vessel to a more remote berth or anchorage, or out to sea. Other standard protective measures in response to reactor accidents are evacuation, the use of iodine as a prophylactic, sheltering, and personal measures such as respiratory protection and protective clothing.[23]

9.26 Following an accident, a choice from among the available protective measures would have to be made in the light of the actual situation. To the extent that one measure can be relied upon to work, alternative measures are not required. In the Committee's view, the aim of the planning should be to ensure that measures that may plausibly be required in the event of an accident are available, without wasteful and costly redundancy.

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23. International Atomic Energy Agency, Planning for Off-Site Response to Radiation Accidents in Nuclear Facilities, (Safety Series No. 55, IAEA, Vienna, 1981), pp. 9-10.

9.27 The use of any protective measure incurs costs and risks. An International Atomic Energy Agency safety guide points out:

> As a general principle it will be appropriate to implement protective measures only when their social cost and risk will be less than those resulting from the radiological exposure that would be avoided. In many cases this is a very difficult decision.[24]

Australian port safety plans acknowledge this point.[25]

VESSEL REMOVAL

Appropriateness of the Removal Option

9.28 The Victorian Government argued:

> the assumption that moving a vessel in distress is a desirable strategy must be seriously questioned. The fact that radioactive material is being discharged argues strongly against moving the vessel and would hamper, if not entirely prevent, any efforts to minimise the spread of radioactive materials.[26]

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24. ibid., p. 11. See pp. 15-27 for an indication of the types of costs and risks attached to implementing each of a wide range of protective measures. For further detail on the difficulties of post-accident decision making see International Atomic Energy Agency, Techniques and Decision Making in the Assessment of Off-Site Consequences of an Accident in a Nuclear Facility, (Safety Series No. 86, IAEA, Vienna, 1987), pp. 147-54.
25. Brisbane Port Safety Plan, para. 313; Darwin Port Safety Plan, para. 510; Hobart Safety Scheme, Chapter 4, Annex A, para. 31; WA Port Safety Safety Scheme, para. 920.
26. Submission from the Victorian Government, p. 6. See also the submissions from Coalition Against Nuclear Armed & Powered Ships, p. 3 (Evidence, p. 1375); Senator J. Vallentine, p. 14 (Evidence, p. 1057); Scientists Against Nuclear Arms (Tas), pp. 5-6 (Evidence, pp. 824-25); Scientists Against Nuclear Arms (ACT), p. 4 (Evidence, p. 782). See also Evidence, p. 610 (Prof W. J. Davis).

9.29 This view appears to be based on a misunderstanding of when vessel removal would be most useful and what it seeks to achieve. The reason why exposure to radiation at doses exceeding the emergency reference levels will occur most rapidly if the plume remains concentrated was explained in paragraph 8.40. The aim of vessel removal is to assist dispersion, and to avoid all the radioactive material remaining concentrated in a place where it will lead to individual doses approaching or exceeding the emergency reference levels.

9.30 This point is relevant also to concerns expressed about the difficulty of towing in rough seas and stormy weather,[27] and to the fact that towing capability is required to be able to cope with moderate sea conditions (up to sea-state 3) only.[28] Seas sufficiently rough to hamper vessel removal will almost certainly be accompanied by winds sufficiently strong to eliminate the need for removal.

9.31 A further concern was the perceived need to remove an accident-stricken vessel from HMAS STIRLING, at the southern end of Cockburn Sound, northwards through a dredged channel towards Fremantle in order to reach the open sea. Senator Vallentine told the Committee:

> a vessel berthed at HMAS Stirling with a damaged reactor would have to be towed up the channel in order to be moved out to open sea. This narrow channel is the only entry and exit from the naval base. Any vessel being towed through it would pollute the entire coastal strip as it went, as well as contaminate Rottnest Island as it headed out to open sea.[29]

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27. Submissions from Mr J. R. Budge, p. 1; Mrs L. Van Geloven, p. 4.
28. OPSMAN 1 (2nd edn.), para. 432 (Evidence, p. 77).
29. Submission from Senior J. Vallentine, p. 14, (Evidence, p. 1057). See also the submission from Mr R. Bolt, p. 12 (Evidence, p. 962); Evidence, pp. 920 and 932-34 (Mr M. Lynch): at p. 920 a similar type of criticism is made of the route to the remote anchorage at Hobart.

9.32 This argument overlooks the fact that there are two approved remote anchorages and a remote berth towards the southern end of Cockburn Sound.[30] Assuming a stricken vessel needed to be moved at all, it would not need to be moved up the channel in order to reach an approved remote location. Any decision to move the vessel to sea rather than one of these locations would take weather conditions into account.

9.33 If the accident occurred to a multi-reactor vessel at HMAS STIRLING and the decision was made to move it out to sea, the Department of Defence expect it would be moving at its normal transit speed up the channel by means of its undamaged reactor.[31] This would maximise dispersal, and therefore minimise the hazard.

9.34 Even a slow-moving vessel under tow following the reference accident would not pose a significant hazard to the populated areas to the east of the channel from HMAS STIRLING to the open sea. As indicated in paragraphs 8.37 and 8.53, the maximum distance for which protective measures are required following the reference accident is calculated by the Australian Nuclear Science and Technology Organisation (ANSTO) at 2.2 kilometres, based on 12-hour exposure of an individual to the resulting radiation. The dredged channel does not come closer than about 4 kilometres to the mainland. The vessel being removed, because it is moving, will not create this type of 12-hour exposure for any fixed position 2.2 kilometres away.

9.35 The Committee does not regard as valid the criticism that vessel removal is an unsound option which, if employed, would be bound to increase rather than decrease the radiation hazard to the public. It does not follow, of course, that it

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30. OPSMAN 1 (2nd edn.), Chapter 2, Annex A (Evidence, p. 52). These locations have been criticised on the basis that they are closer to Perth and Fremantle than the primary berths and anchorages at HMAS STIRLING: submission from Mr R. Addison, p. 9. All the remote locations, however, are over 10 km from the southern part of Fremantle.
31. Evidence, p. 1296 (Department of Defence).

would necessarily be appropriate to exercise the option in all circumstances.

9.36 In examining the adequacy of the arrangements for vessel removal, the Committee took into account that vessel removal was only one of the protective measures available. It is not the case that, if vessel removal fails, all options will be exhausted and that as a result planners have to be absolutely certain vessel removal will work.

9.37 It is unlikely but conceivable that vessel removal would not be possible in a situation where it was otherwise regarded as desirable, and as a result the vessel would remain afloat at its berth or anchorage. In this case options would exist for implementation of other protective measures, particularly evacuation. These measures might need to be implemented over a wider area than Zone 2, but this would only be necessary in the period beginning more than 24 hours after the accident.[32] This period after the accident would permit the arrangements for the wider measures to be made, in the highly unlikely event that they were required.

The Removal Decision

9.38 The Committee obtained advice from the Attorney-General to the effect that Australian authorities have the legal power to order a visiting warship to leave port following a reactor accident.[33] The Commonwealth has delegated to the relevant State or Territory Government the decision-making on whether and when

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32. As noted in para. 9.34, the Zone 2 size is based on 12-hour exposure. But, put simply, the meteorological model used to calculate dispersion assumes something approaching worst-case conditions will only apply during 12 hours in any 24-hour period, due to the change in conditions that occurs normally between day and night times. If the action referred to in the text is required, it will only be after at least this 24-hour period.
33. Letter of Advice from the Attorney General, the Hon Lionel Bowen, to the Committee, 3 April 1987. See also the second supplementary submission from the Department of Defence, p. 11 (Evidence, p. 238.266).

to order removal, and whether to a remote anchorage or to sea.[34]

9.39 OPSMAN 1 states:

> Under certain circumstances it may be advisable for the NPW to remain at the berth or anchorage following a reactor accident. The decision on whether or not to request removal of the vessel would be made after consideration of the relative risks posed to members of the public and to personnel engaged in the removal operation.[35]

9.40 Factors identified by the Department of Defence as relevant to the removal decision include the character and severity of the accident; the amount, type and expected duration of the release of fission products; plume altitude; and meteorological factors.[36] The Department told the Committee that, while a removal decision could possibly be made almost immediately following an accident, 'perhaps more realistically, a decision could be made within a couple of hours'.[37]

9.41 The WA Port Safety Scheme sets out standing procedures to be implemented in the event of an accident. The Committee had difficulty in following these procedures as they related to the decision to remove a vessel from any of the anchorages at Gage Roads off Fremantle. The procedures appear to require that if the accident is notified by the warship's commander, an immediate

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34. OPSMAN 1 (2nd edn.), para. 425 (Evidence, p. 75). See also the second supplementary submission from the Department of Defence, pp. 6 and 11 (Evidence, pp. 238.261 and 268.266). The Western Australian Government is given the power to make removal decisions for vessels at HMAS STIRLING: HMAS STIRLING Sub-Plan, para. 1313(1). No specific plan exists for Jervis Bay, leaving it unclear to the Committee who would make removal decisions in respect of visits there.
35. OPSMAN 1 (2nd edn.), para. 425 (Evidence, p. 75).
36. Second supplementary submission from the Department of Defence, pp. 9-10 (Evidence, pp. 238.264-65).
37. ibid., p. 10 (Evidence, p. 238.265).

removal instruction will be issued.[38] If the accident is detected by early warning monitoring, there appears to be no provision for directing immediate removal. The Committee could see no reason why, if immediate removal is appropriate in one case, it should not be equally appropriate in the other.

9.42 The Committee RECOMMENDS that the wording of the WA Port Safety Scheme be clarified on the question of whether vessel removal procedure differs according to whether the accident is notified by the vessel commander or detected by early warning monitoring.

9.43 A further issue is the fact that the removal decision is to be made (in the one case at least) automatically and immediately. This appears difficult to reconcile with the Department of Defence's view, quoted above from OPSMAN 1, that removal decisions need to be made on a case-by-case basis after considering actual circumstances.

9.44 It may be that there are berths and anchorages whose characteristics are such that a presumption can be made by the decision-maker that immediate and automatic removal would be the appropriate response to any plausible accident scenario. If so,

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38. WA Port Safety Scheme, para. SP B16 occurs immediately under the heading 'Alarm Raised by Nuclear Powered Warship', and provides that the Fremantle Port Authority 'is to immediately direct the nuclear powered warship to an approved remote anchorage or to sea'. The immediately preceeding procedures are under the heading 'Alarm Raised by Monitoring Equipment', and the last of these, SP B15, provides that in the event of a confirmed alarm 'procedures SP B17 to SP B27 will be implemented'. This suggests that SP B16 is not to be implemented, a suggestion reinforced by the heading above SP B16. However, it is possible that this is not what is intended. Under the general heading 'Emergency Procedures', SP B12 provides that following an alarm from the early warning monitoring equipment 'SP B13 to SP B27 will be implemented'. Thus SP B16, the direction to remove, would be implemented on receipt of an alarm as well as on notification by the warship commander. This reading would involve duplication of instructions, as the other elements in SP B16 are also provided for in SP B13. All these procedures relate to vessels with reactors of less than 100 Mw(t) anchored at Gage Roads. The Scheme's provisions for other vessels using Gage Roads are the same in the present context: see SP C13 - SP C17.

there is obvious merit in identifying these and planning accordingly so as to avoid the time required for decision-making following an accident.

9.45 It may also be that the Gage Roads anchorages fit this description. For one of these anchorages, that approved for use by vessels having a reactor power output greater than 100 Mw(t), it is a condition of entry that there be a capability to remove the vessel within two hours of an accident. It may be that, both for this anchorage and for all other Gage Roads anchorages, the automatic and immediate removal decision required by the WA Port Safety Scheme is appropriate, and the position as stated in OPSMAN 1 is at best incomplete. If not, the removal provisions in the WA Port Safety Scheme are inappropriate.

9.46 The Committee RECOMMENDS that the Visiting Ships Panel (Nuclear) develop guidelines to assist decision-makers in determining under what circumstances vessel removal is appropriate. In particular, the guidelines should indicate under what circumstances and at what ports automatic removal following an accident would be appropriate.

Types of Vessels to be Towed

9.47 The condition of entry currently requires towing capability only for vessels not capable of moving under their own power. The Department of Defence takes the view that all multi-reactor warships[39] are capable of moving under their own power, even if one reactor is disabled.[40] Therefore, OPSMAN 1 states

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39. All US nuclear powered surface vessels have two reactors except for the USS Enterprise, which has eight. To avoid cumbersome expression in the discussion in the text, twin-reactor vessels only are discussed. But the points discussed apply equally to the USS Enterprise. All US nuclear powered submarines are powered by single reactors, apart from the USS Triton, which was decommissioned in 1969. All British nuclear powered vessels have only single reactors.
40. Second supplementary submission from the Department of Defence, pp. 7 and 9 (Evidence, pp. 238.262 and 238.264).

that the requirement for a towing capability to be available is limited to single reactor vessels (ie. to submarines).[41]

9.48 This limitation was questioned in submissions on two grounds; that the accident to one reactor might also have disabled the other,[42] and that the delay caused by the need to bring an undamaged reactor up to steaming condition was undesirable.[43]

9.49 The Committee noted that the condition of entry as originally formulated in 1974 did not distinguish between vessels capable of moving under their own power and other vessels.[44] The distinction first formally appeared with the 1981 revision of the conditions of entry.[45]

9.50 The Department of Defence did not indicate to the Committee that it had received any formal assurance from the United States Navy that its multi-reactor vessels would always be able to proceed to sea under their own power in the event of a reactor accident. Rather, the Department's confidence in this regard appeared to be based on the fact that warship designers allow for independent operation of duplicated equipment, such as propulsion plant, in order to cope with battle damage, mechanical

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41. OPSMAN 1 (2nd edn.), para. 422 (Evidence, p. 75). Visiting nuclear powered submarines have auxiliary diesel propulsion, but the Department of Defence considers this may not be powerful enough for vessel removal under adverse tide, wind, etc. conditions, and that towing assistance is therefore a prudent safety measure: second supplementary submission from the Department of Defence, p. 9 (Evidence, p. 238.264). This is a further illustration of the conservatism used in planning for visits.
42. Submissions from Mr R. Addison, p. 9; Mrs L. Van Geloven, p. 4. See also the criticism for the same reason in HR, Hansard, 8 December 1982, p. 3079 (Mr G. Scholes); letter from Senator J. Vallentine to the Committee, 19 August 1988, p. 3.
43. Submission from Mr K. G. Blake, pp. 4-5.
44. Department of Defence, The Environmental Impact of Visits by Nuclear Powered Warships to Australia, (July 1974), para. 143. See also Australia, Environmental Considerations of Visits of Nuclear Powered Warships to Australia, (May 1976), para. 12(e), (Evidence, p. 121).
45. OPSMAN 1 (original edn., 1981), para. 104. See also the conditions of entry as set out in HR, Hansard, 8 December 1982, pp. 3078-79.

breakdowns and accidents.[46]

9.51 While the Committee accepts that independent operation would be a design objective, it lacks information on the extent to which it has been achieved. Clearly it is possible to imagine accident scenarios in which damage occurs to both reactors on a twin-reactor vessel, yet leaves the vessel afloat. The damage to the second reactor may not pose a radiation hazard but may nonetheless leave it unserviceable.

9.52 Logically, the probability of such accidents has to be less than that of an accident which leaves one reactor serviceable. On the information available to the Committee, it is not possible to conclude that such accidents are not credible for planning purposes. In other words, the Committee has insufficient information to conclude that there is no need for any requirement that a towing capability be available.

9.53 A second type of scenario does not involve damage to the second reactor. It focuses on the possibility that the radiation hazard from the accident to the first reactor is such that the crew cannot safely access the reactor controls or machinery spaces needed to move the vessel using the second reactor. The hazard might arise from inhalation of radionuclides, from gamma radiation penetrating through bulkheads and shielding, or both.

9.54 Again the principle of designing for independent operation would suggest that biological shielding around each reactor and ventilation arrangements are adequate to prevent this result. This suggestion is reinforced by the fact that, as merchant ship designs indicate, adequate shielding is technically

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46. Second supplementary submission from the Department of Defence, p. 9 (Evidence, p. 238.264). cf. HR, Hansard, 8 December 1982, p. 3079 (Mr G. Scholes), where criticism was made of the failure of the then Government adequately to explain the reason why it considered that movement by means of the second reactor would always be possible.

feasible within a surface ship's hull.[47]

9.55 The Committee RECOMMENDS that the Department of Defence seek information and assurances from the United States Navy that, with respect to its multi-reactor vessels:

(a) the likelihood of a reactor accident leaving one without propulsion power is not sufficiently credible to require planning; and

(b) the biological shielding and ventilation arrangements are adequate to permit the continued operation of the vessels following the reference accident occurring to one reactor.

If adequate information and assurances are not obtained, the Committee RECOMMENDS that condition (e) of the conditions of entry be amended to require the provision of a towing capability during visits by multi-reactor warships.

9.56 A third scenario relates to the start-up time for the second reactor. During an extended port visit only one reactor on a multi-reactor vessel may be operating. Some delay would occur before a shut-down reactor would be available to provide propulsion power for the vessel. The Committee lacks information on the minimum time necessary to start a naval reactor that has been shut-down for some time, but it may be measured in hours

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47. e.g. US, Department of Commerce, Maritime Administration, Competitive Nuclear Merchant Ship Program - Preliminary Safety Analysis Report, (MA-940-02, April 1974), Tables 15-11 and 15-13. These tables indicate the dose that a person would receive on the bridge, on the main deck, and in the control room following a contained reactor accident on a proposed 312 Mw(t) nuclear powered bulk carrier. The figures are given for thyroid, whole-body, and beta skin doses over 2 hours and over 30 days. All of the doses are well below Australian emergency reference levels. The composition of the source term is the same as that used for ANSTO's reference accident.

rather than minutes.[48]

9.57 Australian authorities plan, however, on the basis that the second reactor is not completely shut down during visits to berths or anchorages where a short removal time is specified. There is, as far as the Committee can discover, no formal arrangement explicitly to this effect. However, condition (e) of the conditions of entry requires that:

> there must be a capability to remove the vessel, either under its own power or under tow, to a designated safe anchorage or a designated distance to sea, within the time frame specified for the particular berth or anchorage, and in any case within 24 hours, if an incident should occur.[49]

9.58 The Australian authorities apparently rely on the fact that the commander of a visiting multi-reactor vessel is made aware of this requirement to be able to leave within the specified time. The commander is also made aware that no towing capability is provided for post-accident departure, and hence the requirement has to be able to be met using the vessel's second reactor alone. The authorities rely on the commander following standard operating procedure in keeping the second reactor on the vessel in a state of readiness sufficient to comply with the requirement.

9.59 The Committee RECOMMENDS that the Department of Defence

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48. N. Polmar and T. B. Allen, Rickover, (Simon and Schuster, New York, 1982), p. 425: 'it takes several hours and considerable electricity to restart a [US naval] reactor after it has been closed down'. Although put in general terms, this statement was made in the context of discussing the time needed to restart the reactor on a single-reactor vessel. It may be that starting a second reactor when one is already operating is a speedier process. One standard text gives as a typical start-up time from complete shutdown for a commercial land-based reactor a time of 13 hours, although this is much reduced if the reactor has only been shut down for a few hours: F. J. Rahn and others, A Guide to Nuclear Power Technology, (Wiley, New York, 1984), p. 498.
49. OPSMAN 1 (2nd edn.), para. 201(e) (Evidence, p. 49). See also ibid., para. 422 (Evidence, p. 75).

confirm that condition of entry (e) is interpreted by the commanders of visiting warships having more than one reactor as requiring that a second reactor be kept in a sufficient state of readiness to be used for post-accident vessel removal. If the Department is unable to confirm this, the Committee RECOMMENDS that condition (e) be reworded to make this state of readiness a condition of entry for multi-reactor warships.

9.60 A further issue relating to towing of multi-reactor vessels was whether one or more tugs might be required to assist in manoeuvring, rather than supplying prime motive power. In 1983 for example, the nuclear powered USS Texas collided with a wharf when leaving Brisbane.[50] Two commercial tugs which would normally have been used were not assisting due to a union ban, although an army tug was present. The damage was not serious enough to prevent the ship's departure.

9.61 Clearly the need for tugs to assist with manoeuvring would vary according to the characteristics of the berth, and to the state of the weather and tide at the time. The Department of Defence told the Committee of the position in relation to the ordinary (ie. not post-accident) movements of visiting nuclear powered warships:

> Australian procedures for tug assistance of NPWs and for NPW escort reflect current practice abroad. In Australia, tug services are requested for all movements of visiting warships. Additionally, visiting NPWs are provided with escort vessels.[51]

9.62 As tug assistance is considered appropriate for all ordinary port movements of nuclear powered warships, it appears to the Committee that provision for similar assistance to be given quickly should be made for post-accident movements. It is

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50. Courier-Mail, 20 July 1983: 'Wharf Bill to Govt'; Sydney Morning Herald, 20 July 1983, p. 2, 'A Brisbane souvenir - deep in the stern of Texas'.
51. Evidence, p. 1300.56 (Department of Defence).

unclear to the Committee, however, if the assistance is essential or merely useful.

9.63 Therefore, the Committee RECOMMENDS that the Department of Defence determine if assistance from one or more tugs would be essential to effect the speedy removal from any approved berth of a multi-reactor vessel with a damaged reactor, and, if so, require as a condition of entry for the visit that the necessary assistance be available during visits to that berth.

Preparing the Vessel for Removal

9.64 A VSP(N) study into aspects of vessel removal following an accident noted:

> The operations involved in removing a NPW include casting off, slipping an anchor or slipping from a buoy, attaching the tow line, towing and securing at a remote location. All of these operations could, if necessary, be undertaken by RAN personnel, however the cooperation of the NPW crew will be necessary to slip the anchor of a vessel being removed from an anchorage.[52]

9.65 The study indicates that the operations required of Royal Australian Navy personnel can all be carried out without exposure of individuals to radiation in excess of recommended levels. The Committee was concerned that the option of vessel removal as a protective measure following an accident depended on actions by that vessel's crew in the case of an anchored vessel. This occurs because the vessel's winch must be used to raise the anchor, or the anchor cable parted inboard of the slip securing the cable to the vessel in order to release the anchor.

9.66 The concern was not that the warship crew will dispute

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52. Department of Defence, VSP(N), Report on the Protection of Personnel Engaged in the Removal of Nuclear Powered Vessels Following a Reactor Accident, (18 May 1984), para. 6.

the necessity for vessel removal. Rather it was that the action of slipping the anchor might involve a severe radiation hazard to the vessel's crew involved. On investigation, the Committee found that this was not a valid concern.

9.67 It appears reasonable to assume that, if a multi-reactor vessel is expected to be able to depart following an accident by using its undamaged reactor, its crew could also raise (or, if necessary, cast loose) its anchor. Even if the expectation relating to vessel removal is incorrect (on which see the discussion in the previous section), the size of multi-reactor vessels (ie. surface ships) means that approaching the anchor release slip from on board would not be exceptionally hazardous.

9.68 For both surface ships and submarines, the length and bulk of the vessel would provide shielding for a person on the bow from the direct gamma radiation dose,[53] even in the unlikely event that reactor shielding was inadequate to protect persons closer to the reactor. The risk from inhalation also needs to be considered. The distance of the anchor release point from the reactor would, however, also allow time for crew members to release or raise an anchor without exceeding recommended levels of radiation exposure, even in the unlikely event that they

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53. On submarines, the anchor slip point is outside the pressure hull, which would provide further shielding.

lacked respiratory protective equipment.[54]

9.69 Moreover, the Committee understands that the Australian authorities have required and been given assurances by the United States Navy that its crew members will always release or raise the warship's anchor if vessel removal is required.[55]

Time Allowed for Removal - 'Standard' Berths

9.70 Once a decision to remove a vessel has been made, time will be needed to accomplish the removal. One of the conditions of entry to Australian ports by visiting nuclear powered warships is that:

> there must be a capability to remove the vessel ... within the time frame specified for the particular berth or anchorage, and in any case within 24 hours, if an incident should

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54. Department of Defence, VSP(N), Report on the Protection of Personnel Engaged in the Removal of Nuclear Powered Vessels Following a Reactor Accident, (18 May 1984), Annex A, para. 10:

> calculations indicate that, at a distance of 50 m down-wind from the reactor compartment, ie. at the bow or the stern, a thyroid dose of 3 Sv would be accumulated by an unprotected person in seven minutes due to the inhalation of radioactive iodine, and in 28 minutes at a distance of 100 m. (Note: 3 Sv is the emergency reference level for thyroid dose requiring urgent evacuation of adult members of the public.) The corresponding whole body dose rates from gamma radiation due to direct exposure have been calculated to be 0.04 Sv/h at 50 m and 0.012 Sv/h at 100 m [emergency reference level for whole body dose = 0.1 Sv].

Some of the figures tend to overstate exposure as they are based on an assumption that the exposed individuals will be down-wind of the reactor. In typical circumstances, a vessel at anchor will swing down-wind from its anchor. Crew members releasing the anchor will be up-wind of the reactor. In light winds, strong currents, tides, etc. it is possible that the wind direction will not determine the ships's position relative to its anchor. If such a situation were to occur, the VSP(N) figures would be more realistic, as they would be if there was no wind at all.

55. Information supplied at briefings to Committee members by RAN officers at HMAS STIRLING, 2 February 1988; Tasmanian officials, 21 March 1988.

occur.[56]

9.71 The effect of allowing up to 24 hours for removal at 'standard' berths and anchorages gave rise to concern that arrangements for towing might be such that removal would not be able to be achieved for almost 24 hours after the accident.[57] Members of the Committee found the condition, and its paraphrase in OPSMAN 1, unclear in this regard.[58] In practice, the Committee was assured, the removal capacity would be available in a lot less than 24 hours in those places where no time less than 24 hours had been specified.[59]

9.72 The Committee noted that the original (ie. 1974) environmental assessment relating to visits stated as one of the general conditions of entry: 'tugs or other suitable towing craft must be available within one hour of a request'.[60] This condition of entry did not appear in the amended conditions of entry published in 1981.[61] The Committee was not told why the condition of entry had been deleted.

9.73 The Committee considered three options relating to the time allowed for the provision of a towing capability at 'standard' berths:

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56. OPSMAN 1 (2nd edn.), para. 201(e) (Evidence, p. 49). See also ibid., para. 422 (Evidence, p. 75). The time refers to the time by which the vessel must be moved to a point where its contribution to the radiation dose received by a person at the original accident site becomes insignificant. In other words, a period is added to the time when towing commences in order to cater for the radiation caused at the original site by the vessel after it has begun to move away.
57. e.g. see the submission from Mr R. Bolt, p. 5 (Evidence, p. 955); letter from Mr M. Lynch, 23 March 1988, p. 2 (Evidence, p. 915).
58. Evidence, pp. 1297-99. For the paraphrase, see OPSMAN 1 (2nd edn.), para. 422 (Evidence, p. 75).
59. Evidence, pp. 1297-1300 (Department of Defence); p. 443.452 (ANSTO).
60. Department of Defence, The Environmental Impact of Visits by Nuclear Powered Warships to Australia, (July 1974), para. 143. See also Australia, Environmental Considerations of Visits of Nuclear Powered Warships to Australia, (May 1976), para. 12(f), (Evidence, p. 121).
61. OPSMAN 1 (original edn., 1981), para. 104. See also the conditions of entry as set out in HR, Hansard, 8 December 1982, pp. 3078-79.

- retention of the current wording of condition (e) as it relates to the timing of vessel removal and with the meaning as explained to the Committee by the Department of Defence;
- a recommendation that the condition be reworded to put beyond doubt that towing facilities are required to be made available as soon as possible after an accident, rather than merely within the 24 hours specified for vessel removal for berth assessment purposes; and
- a recommendation that the requirement that a towing capability be available within one hour of a request be reinstated as a condition of entry.

9.74 The reinstatement of such an entry condition would do no more than require what the Committee was told was the existing practice. On the other hand, reinstatement would formally require an extra margin of safety that is not now apparently regarded as necessary by the Department of Defence and ANSTO. Even with a 24-hour period specified, the other elements of the plans are designed to provide adequate safety.

9.75 The Committee RECOMMENDS that condition (e) of the conditions of entry be reworded to put beyond doubt that towing facilities are required to be made available as soon as possible after an accident, rather than merely within the maximum time of 24 hours specified for vessel removal for berth assessment purposes.

Time Allowed for Removal - 'Non-Standard' Berths

9.76 In chapter 8 it was noted that variations from what the Committee called 'standard' parameter values for calculating the consequences of the reference accident applied in respect two places. These were the berth and anchorage at Hobart, and an anchorage at Gage Roads off Fremantle. The 24-hour period allowed for vessel removal was reduced to three and a half hours for the

former and two hours for the latter. The Committee concluded that the variations were only acceptable if an assurance could be given that these removal times could be met.[62] The need for this assurance in relation to the berth at Hobart is particularly acute due to the relatively large population in the Zone 2 for the berth.[63]

9.77 The Hobart berth may be used by either single or multi-reactor vessels. Members of the Committee were told at a briefing and inspection in Hobart that the three and a half hours allowed for vessel removal could be met without difficulty: the maximum time to have a towing vessel available would be 45 minutes.[64] The Hobart Safety Scheme provides that, for single-reactor vessels, 'a tug or towing vessel will be on standby for the duration of the visit'.[65] A similar arrangement was made for the only visit to date of a multi-reactor vessel to the berth, although neither the scheme nor the conditions of entry formally require this.[66]

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62. See para. 8.48.
63. See ANSTO's Addendum 1 (18 April 1985) to the original (September 1973) assessment for the berth, p. 2:

> Data presented in the 1973 assessment shows that the residential and transient populations close to Macquarie Wharf are larger than for any currently approved NPW berth in Australia. ... A major factor in the acceptance of NPW berths is the feasibility of implementing countermeasures within the necessary timescale following an accident. For the Macquarie Wharf [berth] the contingency response requirements remain [after taking into account the effect of the reduction in time allowed for vessel removal] more demanding than for any other approved Australian NPW berth and it is recommended that Tasmanian authorities are consulted regarding the feasibility of these requirements, as identified in this assessment, prior to VSP(N) consideration of approval.

The Addendum recommends that approval for the berth 'should only be granted if firm assurances can be obtained' that vessel removal can be achieved within the allowed time, and evacuation of Zone 1 within 1 hour and Zone 2 within 4 hours can be accomplished.

64. Information supplied at briefing to Committee members by Tasmanian and RAN officials, 21 March 1988.
65. Para. 320.
66. Information supplied at briefing to Committee members by Tasmanian and RAN officials, 21 March 1988.

9.78 The Committee considers acceptable the reduction to a maximum of three and a half hours in the time allowed for vessel removal from the Hobart berth and anchorage.[67]

9.79 The reduction in the removal time limit for the Gage Roads anchorage applies only when it is used by vessels having reactors with a power output greater than 100 Mw(t). These vessels, Nimitz-class aircraft carriers, all have two reactors. Therefore the planners expect them to be able to be removed following an accident by means of the undamaged reactor.

9.80 The Committee made recommendations above in relation to the removal of multi-reactor vessels.[68] Subject to implementation of these recommendations, the Committee considers acceptable the reduction to two hours in the time allowed for vessel removal from the Gage Roads anchorage when it is used by vessels having reactors with a power output greater than 100 Mw(t).

Availability of Towing Vessel

9.81 OPSMAN 1 provides:

> The RAN has the responsibility to make arrangements for the provision of towing facilities for NPWs. These may be civil or RAN vessels, manned by civilian or Naval personnel. The RAN, with ANSTO assistance, has the responsibility for developing and maintaining specific training and procedures for personnel engaged in NPW towing operations. The RAN will also provide appropriate equipment which is in the Department of Defence inventory.[69]

9.82 In one submission it was suggested that the removal responsibility should rest with the country to which the vessel

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67. See para. 9.120, however, where the Committee recommends for other reasons that the approval for the berth be withdrawn.
68. See paras. 9.55, 9.59 and 9.63.
69. See OPSMAN 1 (2nd edn.) para. 424 (Evidence, p. 75).

belonged.[70] Members of the Committee were told by Western Australian officials that the escort vessels which normally accompany a nuclear powered aircraft carrier during visits could be used to tow the carrier if it was disabled.[71] However, the United States Navy does not name a specific ship as a towing vessel during a visit.[72]

9.83 In any event, there have been many single-vessel visits. It would, in the Committee's opinion, add to the complications of planning if the foreign country was required to arrange for local towing services to be available in such cases. Australian authorities are better placed to arrange any towing service required, including as it does the need to train and equip the personnel involved and integrate their actions into the overall response. In addition, it is regarded internationally as normal for the host country to provide towing services for visiting warships.

9.84 A number of submissions questioned whether a towing vessel's crew would agree to tow the stricken vessel on the day.[73] In the Committee's view, generalised assertions that emergency personnel would not carry out their role in an emergency are difficult to sustain.[74] Moreover, the authors of the submissions appear to be overestimating the risk to the crew

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70. Submission from Scientists Against Nuclear Arms (WA) and Medical Association for the Prevention of War (WA), p. 13 (Evidence, p. 799).
71. Information supplied at a briefing to Committee members by WA State Emergency Service officials at Fremantle, 1 February 1988.
72. Information supplied at briefing to Committee members by RAN officers at HMAS STIRLING, 2 February 1988.
73. e.g. submissions from Scientist Against Nuclear Arms (WA) and Medical Association for the Prevention of War (WA), p. 13 (Evidence, p. 799); Assoc Prof P. Jennings, p. 3; Senator J. Vallentine, p. 14 (Evidence, p. 1057).
74. See for example I. G. C. Gilmore, 'Education for Action - The Official Sector' in J. Oliver (ed.), Response to Disaster, (Centre for Disaster Studies, James Cook University, Townsville, Qld., 1980), p. 83:
> Individuals and organizations which are charged with, or accept the responsibility for, action on the community's behalf in emergencies and disasters usually show remarkable capacity to cope with the demands of crisis situations.

Several examples are given from Australian disaster responses.

of a towing vessel.

9.85 ANSTO assessed the radiation doses to tug crews and concluded that the vessel removal could be undertaken without individual doses exceeding the appropriate emergency reference level.[75] The Department of Defence told the Committee:

> On each occasion a vessel is assigned for possible towing operations, an officer from the ANSTO briefs the crew on nuclear related precautions. In addition, tug crews are briefed on the method to be used when towing the particular NPW involved.[76]

9.86 The 1986 edition of OPSMAN 1 provided: 'a member of the Radiation Monitoring Group will be onboard the towing vessel to monitor radiation and advise the master'.[77] An amendment made in

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75. Evidence, p. 443.452 (ANSTO). See OPSMAN 1 (2nd edn.), Chapter 4, Annexes E and G (Evidence, pp. 101 and 104-07) for precautions to be taken and special clothing to be worn by tug crews. See also ANSTO, Radiation Monitoring Handbook for Visits by Nuclear Powered Warships to Australian Ports, (ANSTO, Lucas Heights, NSW, 1985), p. 20 (Evidence, p. 314): isodose contour chart is given for gamma radiation dose rates, showing that the gamma radiation hazard is negligible for those approaching from within a 30 degree angle of the bow or stern of the stricken vessel. See also Department of Defence, VSP(N), Report on the Protection of Personnel Engaged in the Removal of Nuclear Powered Vessels Following a Reactor Accident, (18 May 1984), Annex A, paras. 6-9 for calculations of the doses that would be received by the crew of a towing vessel. The total radiation dose received is estimated at about 0.11 Sieverts, which compares with an emergency reference level for whole body dose of 0.10 Sv. The total of 0.11 Sv is made up of doses received during casting off the warship's moorings and attaching a towing line (0.03 Sv), manoeuvring it clear and towing it away (0.05 Sv), and securing the warship following the removal (0.03 Sv). It is noted that the first of these three operations could be undertaken by a shore party, in which case any exposure received would not accrue to the towing vessel crew. Also options exist both to change the entire crew of the towing vessel and to rotate the functions of individuals, should the original crew or an individual receive exposures approaching the emergency reference levels during the course of vessel removal.
76. Second supplementary submission from the Department of Defence, p. 8 (Evidence, p. 238.263). See also Department of Defence, Visits by Nuclear Powered Warships to Australian Ports: Report on Radiation Monitoring during 1987, (DoD, Canberra, 1988), Part II, para. 7: talks on radiation safety given by ANSTO to crew members of RAN tugs which are designated for post-accident NPW removal duties.
77. OPSMAN 1 (Revised edn.), para. 429 (Evidence, p. 77).

1988 removed this statement.[78] The Committee was told that the reason for the deletion was that it had been decided that the presence of a person having the degree of expertise required to be a member of the radiation monitoring group was not necessary. Performance of the monitoring task requires only a relatively low level of training. Arrangements have been made for a member of the towing vessel crew or some other person to receive sufficient training to carry out the necessary monitoring.

9.87 The Committee does not consider inappropriate the substitution of a less expert person. It considers, however, that OPSMAN 1 should reflect the substituted requirement, rather than make no provision on the point. Accordingly, the Committee RECOMMENDS that it be a requirement that a person sufficiently trained to conduct radiation monitoring be on board a vessel designated for emergency towing following a reactor accident.

9.88 The Department of Defence told the Committee that Hobart is the only port currently receiving visits 'where Naval towing resources are not necessarily programmed to coincide with a NPW visit'.[79] Undertakings have been given by civilian tug operators in Hobart to provide tugs in an emergency.[80]

9.89 The Committee concludes that the current plans relating to the arrangements to provide emergency towing services in the unlikely event that they should be required are adequate. The Committee notes the announcement by the Government on 18 October 1988 that it proposed to purchase further tugs for the Royal

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78. OPSMAN 1 (2nd edn.), para. 429.
79. Second supplementary submission from the Department of Defence, p. 8 (Evidence, p. 238.263). For, example, the Committee was told that the Navy would provide a towing vessel at Albany should a visit be made there: information supplied at briefing to Committee members by WA officials, 1 February 1988. Contrast P. Gilding, 'The Darwin Plan', SANA Update (Scientists Against Nuclear Arms Australia Newsletter), September 1988, No. 65, p. 5, where it is incorrectly assumed that civilian tugs and crews would be responsible for vessel removal in Darwin.
80. Second supplementary submission from the Department of Defence, p. 8 (Evidence, p. 238.263).