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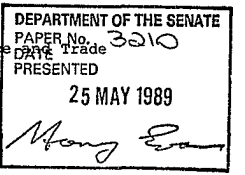

Joint Committee on Foreign Affairs, Defence and Trade

THE PRIORITIES FOR AUSTRALIA'S MINE COUNTERMEASURE NEEDS

May 1989

Australian Government Publishing Service
Canberra

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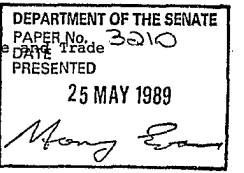

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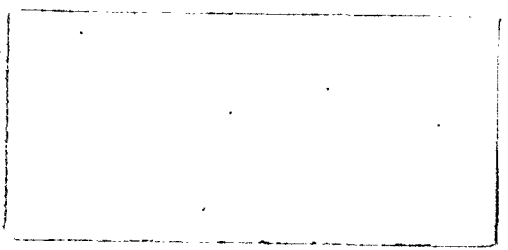

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TERMS OF REFERENCE

The priorities for Australia's mine countermeasure needs, with particular reference to:

a. the nature and related timescales of the mining threat that Australia would be most likely to face,

b. the different technical approaches to mine countermeasures,

c. the defence of our major ports and their approaches, including implications for commercial shipping (such as delay and risk of loss),

d. the security of passage through our major coastal sea routes, including implications for commercial shipping,

e. recent developments in the use of mine warfare, such as in the Persian Gulf, and their implications for Australia,

f. having regard to the different levels of priority that might be identified, the resource implications of the associated different levels of mine countermeasures capability, and

g. the implications for Australian industry.

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35th Parliament
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Mr R F Shipton, MP

Inquiry Staff

Mr A W Stephens
Mr D Woolner
Mrs M Lyons
Mr J Cassells (to March 89)

TABLE OF CONTENTS

GLOSSARY

ADF	Australian Defence Force
AMWF	Australian Mine Warfare Forces
ASEAN	Association of South East Asian Nations
CD	Clearance Diver
CDT	Clearance Diving Team
CDF	Chief of the Defence Force
CNS	Chief of Naval Staff
COOP	Craft of Opportunity
DG	Degaussing
DGNFP	Director General Naval Forward Planning
DGNW	Director General Naval Warfare
DOA 87	'Defence of Australia' (1987 Defence White Paper)
DSTO	Defence Science and Technology Organisation
dwt	dead weight tonnage
EEZ	Exclusive Economic Zone
FAS	First Assistant Secretary
FDA	Force Development and Analysis
FFV	Foreign Fishing Vessel
FRG	Federal Republic of Germany
FYDP	Five Year Defence Plan
GBR	Great Barrier Reef
GFE	Government Furnished Equipment
GRP	Glass Reinforced Plastic
HOOP	Helicopter of Opportunity
HQADF	Headquarters Australian Defence Force
ICJ	International Court of Justice
ITR	Invitation to Register

JCFADT	Joint Committee on Foreign Affairs, Defence and Trade
KAE	Krupp Atlas Elektronik
kt	knots
LBMTR	Land Based Magnetic Test Range
LNG	Liquid Natural Gas
MCM	Mine Countermeasures
MCMV	Mine Countermeasures Vehicle
MHC	Mine Hunter Coastal
MHI	Mine Hunter Inshore
MRL	Materials Research Laboratory
MWPS	Mine Warfare Pilot Survey
MWSC	Mine Warfare Systems Centre
NATO	North Atlantic Treaty Organisation
PNF	Permanent Naval Forces
RAAF	Royal Australian Air Force
RAN	Royal Australian Navy
RANTAU	Royal Australian Navy Trials and Assessing Unit
RN	Royal Navy
ROV	Remotely Operated Vehicle
RSL	Returned Services League
SIP	Strategic and International Policy (Division)
UNCLOS	UN Convention on the Law of the Sea
USI	United Services Institute
UWCSD	Underwater Weapon and Countermeasure Systems Division
WWII	World War Two

LIST OF FIGURES AND TABLES

FOREWORD

1. In its report on *The Australian Defence Force: its structure and capabilities,* published in 1984, this Committee identified a requirement for the ADF to 'develop within its maritime defence forces a small but highly capable mine countermeasures capacity'. That requirement had previously been noted in the 1976 Defence White Paper and was subsequently reflected in the 1987 White Paper.

2. On 29 December 1987 the Minister for Defence formally requested the Joint Committee on Foreign Affairs, Defence and Trade to inquire into the priorities for Australia's mine countermeasure needs. The Committee accepted the inquiry in accordance with the terms of reference listed at p iii of this report.

3. During the first half of 1988 the Defence Sub-Committee was largely occupied with its inquiry into personnel wastage in the ADF and was able to commit only limited time to mine countermeasures. However, once the bulk of the evidence had been taken for the personnel wastage inquiry, Committee members were able to focus on mine warfare. The inquiry was advertised nationally and submissions called for; briefings, visits and inspections were arranged; and public hearings conducted.

4. Because of the highly specialised nature of mine warfare the public response to the inquiry was understandably small. Nevertheless, the evidence received presented a generally thoughtful, and in some cases innovative, examination of the subject.

5. As has been the case throughout the 35th Parliament, the Minister for Defence and the Minister for Defence Science and Personnel, the Australian Defence Force and the Department of Defence gave the Committee their full support. We wish to record our appreciation for that assistance. We would also like to thank all of those associations and individuals who made submissions, gave evidence or assisted the inquiry. In particular, the contribution from RAN and DSTO mine countermeasure specialists was appreciated.

6. Mine countermeasure operations do not enjoy a high profile in the Australian defence debate. The inattention and relative neglect which attended MCM force development in the ADF for some years is inconsistent with the potential of offensive mine warfare. Recent experiences in other parts of the world have clearly illustrated the relative ease with which an offensive mining capability can be acquired, and the cost-effectiveness of mine warfare.

7. It is this Committee's opinion that the development of a capable MCM force must be one of the highest priorities for the ADF. We acknowledge the present Government's efforts to establish that force, and trust that this report will make a constructive contribution to the process.

LIST OF RECOMMENDATIONS

Reviving the MHI Project

1. Some ten years after the minehunter weapons system project was initiated the MHI still lacks a suitable sonar. The Committee concludes that proceeding with the DSQS-11H sonar as the basis of restoring the RAN's MCM capability is too risky. It may involve further expense, and will probably take too long. The option should not be proceeded with. The best option is that which allows the earliest commencement of useful trials.

RECOMMENDATION:

> The Minister for Defence to seek a single source procurement of a proven integrated sonar system, exercising options other than purchase in the first instance if this will enable the earliest resumption of trials with the MHI.

Concept of Operations

2. A dichotomy exists between some proposed or existing MCM assets and the concept of operations. This is most apparent in the case of the MHI. Unfortunately, the MHI's development has taken so long that its operational specifications have been overtaken by events. It does not possess those broad characteristics identified in the White Paper as necessary for the ADF: 'range, endurance, and mobility, and independent logistic support'.

RECOMMENDATION:

That until the MHI has been fully evaluated and proven, no further construction of this class be undertaken.

RECOMMENDATION:

That the further development of the minehunting capability for the RAN be directed towards the acquisition of coastal minehunters (MHC).

RECOMMENDATION:

In order to improve the deployability of MCM forces, priority should be given to acquiring large COOP platforms.

Operational Base Selection

3. Threat assessments indicate that substantial MCM capabilities should be based in the north. The defence of our north east coast also is growing increasingly important, while the major fleet bases at Sydney and HMAS STIRLING must be protected.

RECOMMENDATION:

That the home ports for the MCM force be established at Sydney, HMAS STIRLING, Darwin and in the Great Barrier Reef region.

Precursor Sweeping

4. The Committee remains unconvinced of the suitability of the drone boat concept in all instances, given its associated deployment difficulties.

RECOMMENDATION:

> CDF to direct that the development of helicopter towed sweeps should continue, and be extended to include all suitable Service types. The capability should continue to be exercised on a basis adequate for retention of skills.

Offensive Minewarfare

5. A credible offensive mining capability would increase the ADF's options in its conduct of operations at all levels of conflict, and could help government to control any escalatory response in a low intensity conflict.

RECOMMENDATION:

> That a visible offensive mining capability be developed for the expansion base of the ADF, including the procurement of modern mines and modest development of suitable deployment platforms.

Information, Surveillance and Support

6. Since the capacity of the RAN to conduct mine clearance operations in Australian ports will be limited, it will be of great importance during the course of any hostilities to extend control of sea traffic around Australia, particularly during low level hostilities. The government's ability to sustain its political strategy should be enhanced by making the nation's legal rights as clear as possible in all operational areas. Undoubtedly, in open waters, this position is most clearly recognised in regard to a nation's territorial seas.

RECOMMENDATION:

The Government to declare a 12 mile territorial sea consistent with the ratification of UNCLOS, and that this matter be pursued with some urgency.

RECOMMENDATION:

The Minister actively to support Navy's concept for port defence; and that the concept be staffed at a central level with the objective of developing an organisation which can be exercised on a regular basis.

Australian Industry

7. There is a number of Australian companies with expertise in particular areas of higher technologies relevant to the MCM program which could be funded to participate, if a broader level of industrial support is considered relevant to the development of future MCM capabilities. The equipments available from these sources range from navigational systems to small, remotely-controlled submersibles. These producers could become the source of MCM systems, but only at a cost of time delay and financial penalty; and the volume of production which might result would scarcely be sufficient to affect the viability of the companies involved.

8. Australia's experience in the export of military equipment in recent years is that quality of product is often less important than special conditions of sale. In this context, the modest prospect of exports deriving from the MCM program is not a factor sufficient to affect the development of force structure policy.

Force Structure

9. The Committee considers that the minimum level for MCM forces maintained in the ADF is that required to keep open two northern ports in an escalated low level threat, whilst providing for security of operations from the main naval bases in Port Jackson and Cockburn Sound. The Committee also strongly endorses the Defence position regarding the overall importance of the MCM infrastructure. This includes the MCM training school, the MWPS and elements for its operational application, magnetic and acoustic ranging facilities, and maintenance, communications and base facilities.

RECOMMENDATION:

The MCM Force Structure to be:

- 3 x MHI
- 4 x MHC
- 11 X COOP (6 large; 5 small).

The force disposition should be as follows:

	MHI	MHC	COOP
Sydney	2	-	2 (small)
GBR	-	2	2 (large)
Darwin	-	2	2 (large)
Stirling	1	-	3 (2 large, 1 small)
Melbourne*	-	-	2 (small)

* Permanent attachment from Sydney home port

The existing Clearance Diving capability of three teams should be maintained.

RECOMMENDATION:

That two additional COOP be fitted for COOP(I) activities.

A Regional MCM Force

10. Recent MCM operations in the Persian Gulf and the Red Sea have been notable for their international cooperation.

RECOMMENDATION:

> The Government to investigate the possibility of forming a regional MCM force; and otherwise to pursue the conduct of bilateral MCM exercises with regional nations.

Allocation of Resources

11. Defence has allocated some $500m to the MCM projects currently underway, and it estimates the cost of an MCM force of the size supported by the Committee at between $550m and $850m. The Committee received evidence that Defence planned to spend the majority of funds already allocated in the 1989-94 FYDP. In reality, however, it appears that the hiatus in the MHI program will significantly curtail spending during the FYDP period.

12. On the basis of Defence advice that, under normal procurement procedures, an alternative sonar system is unlikely to be acquired and fitted to any additional MHI hulls until early 1994, it is apparent that little spending on this project would be possible during the FYDP. The four MHI proposed on current planning assumptions would cost $344m, compared with $106m for the COOP project and $40m for the MWSC. The minehunter component of the force is clearly the most costly, and if current policy is allowed to stand there will be a significant underspend on MCM forces during the FYDP.

13. We are concerned that this circumstance will inevitably lead to a conflict with the funding and management demands of the new submarine and ANZAC ship projects in the mid-to-late 1990s. Both projects are scheduled to be in full production by that time, and naval project management will be contending with both the demands of the programs and the loss of qualified personnel to the contractors.

14. For this reason the Committee has stated a priority for accelerated procurement options in the future development of the MCM force.

Personnel

15. Equipment without people represents only half of the defence capability equation. It is essential to remember that the lead time for recruiting and training people to operational standard can be at least as long as that needed to acquire equipment. The retention of a skilled personnel base is fundamental if Australia is to regain an effective MCM capability.

16. The Committee is concerned by the high loss rate from the ADF of MCM specialists. We believe that the recommendations made regarding job satisfaction in our 1988 report on personnel wastage are particularly relevant, as is the recommendation in this report on reviving the minehunting element of the force.

The Program Priority for Australia's Mine Countermeasure Needs

17. Mine warfare is applicable at all levels of conflict facing Australia. The sea mine can be used with little warning; it is an easily-acquired capability; and is highly likely to generate a disproportionate response. Effective MCM will be necessary to ensure that the ADF can function during most levels of conflict, and certainly once Armed Forces have come into open conflict. An MCM capability therefore has a priority for both the force-in-being and as part of the expansion base.

18. The current unsatisfactory state of the RAN's MCM forces has not developed because of ignorance of either the potential of mine warfare or the Australian requirements to counter it. The MHI has been accorded a 'high priority' since its approval in 1976. Yet despite this nominal management support for the project, some 13 years down the track the ADF today is on the verge of having no MCM capability.

19. The Committee feels compelled to record its strong dissatisfaction with the fact that the MCM program has been so inordinantly protracted. We fail to understand why, when problems became evident, recourse to alternative strategies was not taken. It is clear that an MCM capability must rank equally in the RAN's force structure with the submarine and surface warship programs, but demands more urgency. In our opinion, Defence should re-examine its management procedures to ensure that its commitments to programming already underway, particularly the New Submarine and ANZAC Ship programs, do not materially interfere with the development of the RAN's MCM force.

20. During the course of the inquiry, the Committee was impressed by the technical expertise and dedication which the Navy's MCM force is able to apply to overcome the risks of hostile mining. We have, however, observed that the value of this resource and the need to support it has not always been given proper recognition at high levels within Defence. To ensure the future development of the RAN's MCM force, adequate managerial and technical support must be allocated by the Department of Defence and the ADF.

RECOMMENDATION:

> That the development of the Royal Australian Navy's MCM capabilities be accorded priority in the procurement, personnel and policy activities of the Department of Defence.

CHAPTER ONE

INTRODUCTION

The Defence Policy Framework

1.1 The 1987 White Paper *The Defence of Australia* presented policy information emphasising the need for Australia to develop self-reliance in the defence of its mainland and territories and to contribute to regional and global security within the context of alliance relationships. When tabling the Paper, the Minister for Defence noted that realising a self-reliant defence posture would require both a coherent defence strategy and an enhanced defence capability.[1]

1.2 The strategy presented was described as 'defence in depth', the basic concept of which requires a defence force structure capable of detecting, identifying and engaging hostile forces within the Australian environment. Capability enhancement was to be directed to specific priority areas and would be achieved through a capital procurement program spread over some 15 years. The Minister felt that with the flexibility this time scale allowed, and his Government's history of high proportionate spending on the equipment component of the budget, the policy could be implemented 'even without real growth in the defence budget overall':[2]

> The basic point is this: This Government's clear strategic planning with an ordered conception of our defence priorities and its tough financial management mean that we can have more defence without spending more money.[3]

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1. The Hon Kim C Beazley, Minister for Defence, Ministerial Statement 'Defence Policy', *Hansard*, Reps., 19 March 1987, p 1091.
2. *ibid.*, p 1096.
3. *ibid.*, p 1097.

1.3 The areas of the force structure of the Australian Defence Force (ADF) accorded priority in this new formulation of defence policy were determined by an assessment of the defence capabilities which already existed in Australia's region. This was a reflection of a prudent strategic outlook which argued that the capabilities of a nation's military forces provide a more tangible indication of possible threats than the readily changed political intent of its rulers. Clearly, a nation's existing defence capabilities are the source from which security threats against Australia could be launched with little or no warning. The essential priority of defence policy therefore had to be the development of a force structure which could counter that possibility.[4]

1.4 The assessment of those existing military capabilities led to the conclusion that no regional power possessed the capacity to mount a major attack on Australia. However, military capabilities sufficient to allow a nation to engage in a campaign of smaller-scale hostile operations, which would nonetheless require a prompt and significant military response by Australia, already existed within the region. Such possible military operations, which have become known as 'low-level contingencies' in the policy jargon, were described by the Minister as military threats less than invasion; and included actions such as mining of major ports, attacks on offshore resource zones or coastal trade, and raids on northern installations and infrastructure.[5]

1.5 Countering such threats was acknowledged as a difficult task and one requiring considerable effort, especially given the size and remoteness of Australia and the surrounding oceans. However, since the military capability to pursue such actions already existed in the region, 'we must have the ability to counter them with the force-in-being'.[6]

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4. *ibid.*, p 1091.
5. *ibid.*, p 1092.
6. *loc.cit.*

1.6 It is this need to develop and maintain elements within the ADF capable of responding to hostile actions which might arise with little notice that indicates the priorities for the development of the ADF's force structure. Amongst those elements specifically mentioned by the Minister were forces which provided flexibility, mobility and long range capability, and 'comprehensive capabilities in areas ignored in the recent past such as mine countermeasures'.[7]

The Loss of the Australian MCM Capability

1.7 In 1961 Australia purchased six ex-Royal Navy *Ton* class minesweepers. They were modified in British shipyards to suit Australian conditions and eventually left for Sydney in October 1962, where they formed the 1st Mine Countermeasures Squadron. During the late 1960s two of the vessels, HMA Ships CURLEW and SNIPE, were converted to the minehunting role.

1.8 By the mid-1970s the vessels were ageing and the fleet had been reduced to contain maintenance requirements. In January 1975 the retired Chief of Naval Staff (CNS), Sir Richard Peek, was quoted as saying that the remaining four vessels would reach the end of their operational lives by 1977.[8] Through careful maintenance the life of some of the fleet was extended beyond this date, but by 1982 only one sweeper and one of the hunters remained in service. The following year the last sweeper was retired. The remaining minehunter, HMAS CURLEW, was to be retired in 1985[9] but she was retained in service, although only in the capacity of a trials ship assisting in the development of a new class of Australian

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7. *loc.cit.*
8. A W Grazebrook, 'A Navy League View', *The Navy*, November-January 1975/76, p 9.
9. Commander D Ramsden, RAN, 'Australian Mine Countermeasure Vessels - A Dilemma', *Journal of the Australian Naval Institute*, November 1984, p 53.

minehunter. For all practical purposes the RAN no longer possesses an operational capability to respond to the threat of mines laid in Australian waters.

1.9 This disturbing loss of an important capability appears to be attributable at least in part to insufficient priority for MCM activities, as staff work associated with the procurement of new mine countermeasure vessels has been underway for almost two decades. Some of that work was directed at the purchase of British *Hunt* class vessels, but was discontinued on cost grounds in 1972. The *Hunts* are large, dual purpose minesweepers and hunters. Because of the inherent expense of such designs, the RAN began to study the use of combinations of specialised vessels to perform the distinct tasks of minehunting and mine sweeping, for both inshore and offshore environments. In 1975 it was decided to develop an Australian design for a specialised inshore minehunter, and to consider the procurement of minesweepers as a separate issue.[10]

1.10 This decision was formalised in the 1976 *Defence White Paper,* which announced the provision of funds in the 1976-77 Budget. These funds were to purchase long-lead time items for the construction of prototypes of an Australian designed catamaran minehunter, to be built of fibreglass. However, as the Department of Defence has since admitted, the complexity of the project was underestimated[11] and the level of resources allocated to it was inadequate.[12] This, and subsequent technical problems, ensured that the new minehunting force was not assembled by the mid-1980s as planned in the 1976 White Paper. That situation still exists. At the time this report was prepared in May 1989, the performance of the prototype MHI

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10. Paul Dibb, *Review of Australia's Defence Capabilities* (hereafter identified as the 'Dibb Report'), AGPS, Canberra, March 1986, p 125.
11. Joint Committee on Public Accounts, Report 243, *Review of Defence Project Management,* Vol. 2, Project Analyses, Parliament of the Commonwealth of Australia, 1986, p 85.
12. *ibid.,* p 93.

system remained unproven and the future of the project had not been verified by a production decision. Added to this, the Navy has not yet formulated a concept to provide offshore counter mine capabilities.

1.11 The project to provide the minesweeping component of a mine countermeasure force for the RAN initially proceeded even more tardily. The possibility of acquiring *Hunt* class vessels to provide the capability was considered once again, this time by purchasing craft surplus to RN requirements. Initially it was proposed to acquire two such vessels, but the project was scrapped in 1982 because of competition for funds from other procurement programs.[13] Once again, the RAN was directed to seek a simpler solution to fulfil the minesweeping mission.

1.12 Current planning to discharge this directive rests upon the performance of Australian-developed advances in technology which should allow ordinary commercial vessels to carry out several types of mine sweeping mission without major modification to structure or machinery. The concept has the added benefit of flexibility, since the comparatively simple outfitting required should make feasible an expansion of the nation's mine countermeasure forces in time of need through the adaptation of suitable commercial vessels, or 'craft of opportunity' (which gives the project its acronym of 'COOP').

1.13 This concept, and other associated elements required to ensure the establishment of an operational counter mine warfare system, are still in the technical development stage. Their usefulness in providing an answer to Australia's counter mine warfare problems remains dependent upon the success of the promised technological breakthroughs. If these do not materialise, not only will the provision of any RAN minesweeping capability be further delayed, but the only available course to rectify the problem would appear to be an expensive purchase from overseas.

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13. Dibb Report, *loc.cit.*

1.14 As a consequence of policy vacillations, the nation is without a significant capability in an area which, by general consensus and the Minister's express designation, ranks amongst the highest of priorities in defence planning.

1.15 Positive steps are now being taken by the RAN to rectify known problems and to develop the potential of technological approaches to MCM, whilst the Department has planning in place to expedite Navy's activities. The Committee is, however, disturbed to note that the programs underway will require considerable time before they produce an operational element of the ADF's force structure, even should their progress be smooth.

1.16 Deciding whether current planning meets Australia's MCM needs requires an assessment of the technologies of mine warfare, the many factors in Australia's environment, and the options currently available. That assessment is contained in succeeding chapters.

CHAPTER TWO

MINE WARFARE TECHNOLOGY AND EXPERIENCES

2.1 Mine warfare has been characterised by the relative ease with which an aggressor can acquire a mining capability, the disproportionate response required from the victim, and the technological competition between offensive and countermeasure systems. This Chapter briefly examines mine warfare technology and experiences, with the objective of relating developments to Australia's current MCM priorities.

Mine and Mine Countermeasure Technology

Types of Mines

2.2 There are three main types of mine: moored mines, ground mines and rising or homing mines.[1]

a. **Moored Mines.** These mines are tethered to the sea bed by a sinker. The explosive charge and firing mechanism is housed in a buoyant case designed to float at an optimum level for the intended target. The mines can be either contact or influence actuated, and are best suited to deep water areas. Because moored mines must be buoyant, the weight of the explosive is limited. Thus, if contact actuation is used, damage tends to be localised.

b. **Ground Mines.** Ground mines lie on the sea bed and so can only be influence actuated; that is, they are detonated by a vessel's acoustic, magnetic or pressure signature. As ground mines do not have to

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1. Defence, *Submission*, pp S320-21.

be buoyant much greater weights of explosive (up to about 250 kgs) can be used. The destructive potential of ground mines depends on the weight of explosive and the water depth. The weapon's maximum effective depths for surface ships and submarines are about 90 and 200 metres respectively.

c. **Rising or Homing Mines.** This type of mine is short tethered to an anchor on the sea bed. When a target is sensed the mine either rises to an appropriate depth or homes on the target.

Rising and homing mines currently are held only in the inventories of the major powers.[2]

Mine Effectiveness

2.3 Rising and homing mines are considerably more expensive to acquire than moored or ground mines, but their unit cost is offset by the smaller number needed to provide a particular level of minefield effectiveness. As they are employed in deep waters, their utility in the shallow waters of much of Australia's continental shelf area and northern maritime approaches would be constrained. The absence of natural geographic shipping 'funnels' in deep offshore areas, and in which an aggressor might be expected to lay an effective field with few rising or homing mines, further reduces the priority for Australia to counter this weapon.[3]

2.4 Of the other two main types of mine, ground mines are the more effective. They can carry a larger explosive charge, are less affected by the underwater environment (eg, ocean currents) and could be expected to have a longer life. Ground mines can be fitted with a wider variety of actuation units and

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2. Defence, *Submission*, p S321.
3. Defence, *Submission*, pp S321-22.

anti-sweeping settings - such as ship counts or signature filters - and thus are versatile and difficult to clear. They can be deployed more easily from a greater variety of platforms and are less bulky, which permits more to be laid per given platform. Because the explosive effect of a ground mine occurs directly under a ship, it is more likely to break the ship's back and destroy it than is the localised damage typically caused by a moored mine.

2.5 The depth profiles of Australia's ports and shipping routes are such that all are vulnerable to ground mines; that is, each port and its approaches has substantial areas of shallow water (0-90 metres).[4] That factor has led the Department of Defence to draw the following key conclusion:

> Of all the possibilities the ground mine is assessed as the most likely threat we would face because it would be particularly suited to use in the extensive areas of shallow water around Australia. Moored mines could also be employed in shallow waters and cannot be discounted as a threat because some are stockpiled in regional countries. Even though moored mines are less effective than ground mines, they could be useful to an adversary if Australia lacked the means to counter them. In addition, in the much longer term, depending on strategic circumstances, we may have to consider the acquisition of appropriate capabilities to counter deeper laid ground mines and possibly rising and homing mines.[5]

Availability

2.6 An offensive mining capability is easily acquired; further, it is a capability which can be easily concealed. The disruption caused to shipping in the Persian Gulf in the late 1980s by 70-year-old mines laid from a variety of non-military platforms is sufficient testimony to that statement. The conversion of conventional 'dumb' iron aerial bombs to

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4. Defence, *Submission*, p S321.
5. Defence, *Submission*, p S322.

relatively sophisticated sea mines by the use of a small conversion kit is within the capacity of many countries. That conversion process also makes it difficult accurately to assess possible mine stocks. The Committee supports Defence's judgment that those factors indicate that the 'timescales required for a potential adversary to acquire or upgrade a mining capability could be short'.[6]

Active Mine Countermeasures

2.7 Active MCM can be carried out through three principal methods: mine sweeping, mine hunting and clearance diving.

Mine Sweeping

2.8 Mine sweeping is effected either mechanically or through 'influence' activation of the mine. In both techniques the sweeps are deployed at a safe distance from the sweeping vessel. Mechanical sweeps are wires fitted with cutters designed to sever the cables of moored mines which, being buoyant, then float to the surface where they can be destroyed. Influence sweeps simulate a ship's magnetic and acoustic signatures in order to explode mines. While surface vessels have provided the majority of mine sweeping platforms to date, helicopters have been used successfully in some situations.

2.9 Sweeping is limited by, *inter alia:* mine actuation technology which may require a mine to be swept a number of times before it detonates; the sensitivity settings on mines; the MCMV's relative lack of manoeuvrability while trailing sweeps; and the fact that currently there is not in service a satisfactory pressure actuation sweep. Further, a mine sweeper can use only one system (ie, either mechanical or influence) at a time.

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6. Defence, *Submission*, p S323.

2.10 Another significant problem faced by mine sweepers is that mines can be programmed to attack the MCMV itself, using high technology or extremely sensitive actuation devices. The most common response to that problem has been the use of 'precursor' sweeping platforms which will not lead to loss of life when they detonate a mine. Perhaps the best known of these is the helicopter which, with conventional mines, will always be a safe distance from any blast. Unmanned drone boats and remotely operated vehicles can also be used as precursor vehicles, while airships may have a role in the future.

Mine Hunting

2.11 Mine hunting is a highly specialised operation, requiring purpose-built vessels and detection and disposal equipments. It involves the use of sonar to locate and identify mines, and complementary systems - often a Remotely Operated Vehicle (ROV) - to destroy the mines. An ROV with a device such as low-light television can also assist in the identification process.

2.12 Minehunting offers a number of advantages over sweeping:

a. the use of forward looking sonar enables the hunter to avoid going over mines while searching;

b. a hunter can lead ships through or around a minefield after only limited clearance operations;

c. compared to sweeping, hunting allows greater manoeuvrability and therefore can be more effective in confined areas;

d. the hunting technique of accurately locating and positively identifying bottom objects facilitates the recovery intact of mines for examination;

e. the destruction of mines is controlled, thus minimising the risk of damage to equipment; and

f. currently minehunting is the only technique offering a high probability of detecting pressure actuation mines.[7]

2.13 On the other hand, minehunting can be a laborious and time-consuming process which can be constrained by adverse environmental conditions such as poor sonar propagation and sea bottom conditions which cover mines. Further, the Australian MHIs will be fitted with hull mounted sonar, which can be limited by:

a. sonar quenching (caused by air bubbles suspended in the water); and

b. degraded sonar stabilisation (which is necessary for the extreme bearing discrimination needed for detecting mines with sonar).[8]

2.14 A crucial element in hunting is the compilation of an extremely accurate and extensive data base of mine-like objects in 'MCM areas of interest', that is, areas which would be attractive targets for mining. Those data are used as the basis both for planning operations and as a reference base against which continuing mine hunting surveys can be compared. The RAN is establishing a Mine Warfare Systems Centre (MWSC) which will play the central role in directing, compiling and analysing the MCM data.

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7. Defence, *Submission*, p S327.
8. Defence, *Submission*, p S350.

Clearance Diving

2.15 Clearance Divers (CDs) are specially trained in the underwater location, identification, disposal and recovery of mines. They can work independently or in support of mine hunting vessels. While CD operations are very slow, they have particular application to areas in which hunting or sweeping are impractical.

Operational Considerations

2.16 Like many defensive military activities, MCM tends to be reactive and thus is subject to a continuing need to counter offensive technological developments.

2.17 The general practice of acquiring complementary mine hunting and sweeping forces supported by CD teams is a logical response to the MCM problem. It is also clear that MCM must be supported by an innovative and active research organisation if the defender is to be able to counter offensive mine warfare developments. In that context the Committee endorses the work of the Defence Science and Technology Organisation's Underwater Weapon and Countermeasure Systems Division in keeping Australia at the forefront of technology.

Taking the Initiative

2.18 It might be argued that comment on offensive mining operations is outside the terms of reference for this inquiry. However, it is self-evident that offensive action which pre-empts an aggressor's ability to conduct mining would be the most effective form of active MCM operations. The Committee believes that the ADF's existing force structure provides a capability for such action.

2.19 Another active option is that of laying defensive mine fields in one's own waters. Again, the ADF has that capability.

Deterrence

2.20 Clearly it is preferable to prevent mining rather than to react after the event. The concept of deterrence as part of an active MCM program is of peripheral relevance to the low-level contingencies identified by the 1987 White Paper as constituting the most likely short-term action against Australia. At higher-level contingencies, however, the ability to deter, say, air-laid minefields through the possession of an effective air defence system becomes important. The same observation applies to the ADF's surface patrol forces - both bluewater and inshore - and ASW element.

Passive Mine Countermeasures

2.21 Passive MCM comprehends a range of activities designed to reduce a potential target's vulnerability to mines and to support the total MCM program.

Self-Protection

2.22 Self-protection will vary according to a vessel's role and likely exposure to mining: MCMVs, for example, need the maximum degree of protection. Measures available include the following:

a. making hulls and fittings shock resistant;

b. minimising acoustic, magnetic and pressure signatures;

c. operating at high tide (in an attempt to counter moored mines); and

d. using geography and the information from mine warfare pilot surveys to minimise exposure to areas suitable for mining

Support Facilities

2.23 Passive MCM requires the support of a number of facilities:

a. a Land Based Magnetic Test Range (LBMTR) for ranging (measuring) MCM equipment and stores prior to their installation in MCM vessels;

b. static acoustic and magnetic calibration ranges;

c. mobile acoustic and magnetic ranges; and

d. training areas in which the full range of MCM techniques can be practised.

The ADF has those facilities.

Mine Warfare Pilot Survey

2.24 As mentioned above, an extremely accurate and extensive data base of mine-like objects is a vital adjunct to MCM, especially mine hunting. The compilation of that data base should be a continuing peacetime activity, with the objective of building comprehensive sonar 'pictures' of port and approach seabeds and environmental data.

2.25 Mine Warfare Pilot Surveys (MWPS) are carried out by a combination of mine hunting and survey vessels. The surveys not only facilitate the identification of new mine-like objects in an area of interest, but also assist planning staff and commanders in their selection of routes to be cleared. The ADF conducted an active MWPS program in the past, but has now effectively lost that capability with the degradation of the MCM force. The only MHI, HMAS CURLEW, is limited in its deployment capacity, and will shortly be paid off; while the side scan sonar used on the craft-of-opportunity mine sweepers is not sufficiently accurate for primary data collection.

Mine and Countermine Warfare Experience

2.26 The first recorded use of sea mines took place in 1776, when American forces under the command of George Washington used crude mines during an attack on a British fleet anchored in the Delaware River. That attack failed. Since then, however, sea mines have been used effectively in many conflicts, including both world wars, Korea, Vietnam and, most recently, the Middle East. In all of those conflicts offensive mine warfare operations were notable for their cost-effectiveness, particularly in terms of the disproportionate response they demanded from defenders.

2.27 In addition to their cost-effectiveness, sea mines offer a singular capacity for non-attributable operations. It therefore is useful to separate their use into overt and covert actions. The examples presented below have been selected for their relevance to Australia.

Overt Operations

2.28 During the Second World War mining operations in Australian waters were undertaken by the German raiders ORION and PINGUIN and the merchant ship PASSAT. A small number of dummy mines was laid off Albany; while small minefields were laid in the approaches to Newcastle, Sydney and Hobart, and in the western and eastern approaches to Bass Strait. In all, about 230 moored contact mines were laid.

2.29 That relatively small effort by Germany resulted in the loss of three allied ships totalling about 18 000 tonnes displacement, and severe damage to another. Perhaps more significant, however, was the response the German campaign generated.

2.30 The Australian minesweeping force eventually comprised 92 vessels, consisting of a mixture of auxiliary minesweepers (requisitioned merchant ships) and purpose built units. Minesweeping groups were maintained at the ports of Sydney, Melbourne, Hobart, Adelaide, Fremantle, Darwin, Brisbane and Newcastle. In return for a very small effort, Germany tied up a substantial amount of Australian resources.

2.31 The Department of Defence's assessment of the German operation is noteworthy:

> Offensive minefields laid in Australian waters ... were relatively small and placed in port approaches or where shipping movements were constrained, such as in port approaches. *This approach remains valid today and is consistent with present assessments of the more likely areas to be targeted by a potential adversary.*[9]

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9. *Submission*, p S313 (emphasis added).

2.32 A graphic example of the relative ease with which a mine warfare capability can be acquired, and its potential effectiveness, was provided by the communist forces during the Korean War. In order to support the advance of their army up the Korean Peninsula, the United Nations forces planned an amphibious assault on the port of Wonsan. The communist forces hastily assembled a fleet of junks and laid a defensive field of some 3000 old but still functional Russian mines around Wonsan. Largely because the UN force lacked modern minesweepers the assault landing was delayed for eight days. A senior US commander summarised the operation in a message to Washington:

> We have lost control of the sea, to a nation without a navy, using obsolete weapons, laid by ships in use at the time of Jesus Christ.[10]

2.33 The final example of overt operations of interest here is the US mining of Haiphong and other Vietnamese waters during the Second Indo-China War. Haiphong was mined from May 1972, initially by carrier based aircraft. The mines were set with a three day arming delay to allow vessels to leave the port. At the end of the period of grace 27 ships remained. Those vessels subsequently were blockaded in Haiphong for 300 days, while none entered the port. The mine field eventually was cleared by the US as part of the post-war political settlement. Clearing operations were estimated to have cost between double and twenty times as much as the minelaying.[11]

2.34 Two significant points emerge from the Haiphong operation. The first is that it was extremely successful. Not only did it seriously disrupt supplies to the North, but it also was considered by some commentators to have hastened the

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10. Quoted in R H Crane 'Mine Warfare - History and Development', in *Journal of the Australian Naval Institute*, Vol. 10, No. 4, November 1984, p 38.
11. Cited in H J Donohue, 'Maritime Mining - An Australian Perspective', in *Journal of the Australian Naval Institute*, Vol. 10, No. 4, November 1984, p 17.

process of the Paris peace talks. Second, the campaign clearly demonstrated the utility of sea mines at the 'minimum' level of conflict. One of the great attractions of mine warfare is that it is not necessary to inflict direct damage to be successful. On the contrary, a mining campaign can be considered to have achieved its objective if an adversary does not challenge the minefield and does not sustain any direct losses. That was the case in North Vietnam. The point here carries even more impact when the 'minimum' level mine warfare operation is viewed against the 'maximum' level of conflict which generally characterised fighting in Vietnam.

Covert Operations

2.35 The examples outlined above illustrate some of the particular attractions of the sea mine used overtly. Another aspect of the weapon which plainly has - and will continue to have - appeal to some groups is its relative anonymity. Given the ease with which mines can be laid, it is not difficult to avoid attribution. The weapon therefore has considerable attraction for those who wish to mount clandestine operations, such as terrorist groups or governments acting illegally. The examples used here are those of the Red Sea/Suez Canal, the Persian Gulf and Nicaragua.

2.36 In mid-1984, 16 or so ships were damaged by covertly-laid mines in the Suez Canal/Red Sea area. There is some speculation that Libya may have been involved, with the mines possibly deployed from a roll-on roll-off cargo ship.[12] The mining created a great deal of concern and uncertainty, and an expensive, time-consuming clearance operation was necessary. The extent of that operation can be gauged from the fact that at various stages it involved MCM forces from the US, USSR, UK, Italy, France, Egypt and Saudi Arabia.

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12. Defence, *Submission*, p S379.

2.37 A similar response was generated by the mining of the Persian Gulf during the Iran/Iraq War. Both protagonists are believed to have been involved. The deployment of mines - many of which were of pre-World War I vintage - necessitated a response which eventually involved about 20 specialist MCM vessels.

2.38 Two interesting points emerged from the Persian Gulf mining. The first was that, notwithstanding the presence in the Gulf region of a considerable number of neutral military forces - including high technology surveillance elements - the detection of those responsible for laying mines proved very difficult. It was not until mid-1987 when the landing craft IRAN AJR was apprehended off Bahrain carrying mines that positive results were achieved. Even then, however, Iran continued to deny responsibility for mining, as the IRAN AJR was not actually laying mines when sighted.

2.39 That leads to the second point. Being apprehended in the possession of mines may present a *prima facie* case of culpability, but unless there is irrefutable evidence that mines were actually laid, it remains possible to deny responsibility.

2.40 The covert mining of the Red Sea appears to have been a terrorist action, while that in the Persian Gulf took place during open warfare (but still placed neutral shipping in international waters at risk). Mining operations against Nicaragua in 1983-84 seem to fall into a different category again, namely, that of a government acting illegally either though a surrogate force or a clandestine organisation. A number of vessels struck mines off the ports of El Bluff, Corinto and Puerto Sandino in what clearly was part of wider military action against Nicaragua. Nicaragua and the Soviet

Union accused the US of being responsible, an accusation that subsequently was supported by the findings of the International Court of Justice. The US denied any involvement in the operation and refused to recognise the jurisdiction of the International Court.

2.41 The characteristic anonymity of offensive mining has enabled the responsible country to remain unidentified. In the meantime, the Nicaraguan Government, already trying to manage a devastated economy, had to embark on the rapid acquisition of an MCM capability.

2.42 Commenting on recent covert mining operations, the Department of Defence drew the following conclusion:

> Importantly, international legal conventions have not been complied with and the laying country or organisation has undertaken (its) activities in a disavowable manner, not declared mine danger zones, nor assisted in the mine clearance operations.[13]

2.43 That conclusion neatly summarises both the realities and attractions of covert mine warfare operations.

Conclusion

2.44 The circumstances under which mining was conducted in some of the areas reviewed above have relevance for Australia. First, the use of even small numbers of low-technology mines in ports and approaches comparable to ours presented an unacceptable risk to shipping, as evidenced by the considerable number of vessels which were either sunk or severely damaged.[14] Second, the necessary numbers of MCMVs to clear the mines in a

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13. Defence, *Submission*, p S361.
14. In the Persian Gulf, for example, 14 ships were either sunk or severely damaged, including the 275 000 tonne tanker BRIDGETOWN and the USN frigate USS SAMUEL B ROBERTS.

timely way was obtained in a number of cases by a collective international effort. Third, it is plain that an offensive mining capability can be acquired quickly and easily, and a protagonist may not always be readily identified: that latter factor may both complicate the MCM response and allow an aggressor to ignore international conventions. Finally, the continuing technological development of mines, and the diversity of conditions in which they can be deployed, indicates that an effective MCM force must be able to operate across the spectrum of threats and environmental conditions.

CHAPTER THREE

THE OPPORTUNITIES FOR MINE WARFARE IN THE AUSTRALIAN ENVIRONMENT

3.1 Mine warfare presents many options for aggressive action against nations with maritime trade and naval defence interests. The Dibb Report, released in March 1986, supported the proposition that the sea is the most likely area in which Australian interests could first come under military threat. As Dibb pointed out, greater flexibility can be employed in hostile operations at sea. A range of options exists, from shadowing through to combat; whilst the extent of Australia's maritime approaches and resource areas gives an opponent a variety of targets and locations which could be engaged in such a way as to unbalance the response of the ADF.[1] By contrast, raids on the Australian mainland would be difficult to mount, the territory to be crossed is inhospitable, and any hostile lodgement on Australian soil would necessarily show an aggressor's hand and invite full retaliation.

3.2 The 1987 White Paper further developed the notion that the characteristics of the Australian environment must be a central element in the development of defence policy. As the Paper noted, that environment indicates the importance of the maritime approaches and the north of the continent and, consequently, the need for maritime and other forces sufficient to maintain control of those areas.[2]

3.3 As discussed in Chapter 1, Defence's analysis of military capabilities in the region indicated that a major conventional attack could not be delivered by regional nations, but that lower level operations could be mounted with very

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1. Dibb, *op.cit.*, p 67.
2. Department of Defence, *The Defence of Australia*, AGPS, Canberra 1987, p 21.

little warning should current political relationships change. Furthermore, the White Paper assessed that an adversary may be able to sustain such low level activity 'virtually indefinitely'.[3] The implication was that the structure of the ADF should include the types of forces suitable for countering such threats.[4] It is now more than 12 years since the MCM program started. Three years ago Navy acknowledged that it possessed only a token MCM vessel[5] and the situation of its Mine Countermeasure Force has not visibly altered. Urgent attention must be given to the matter of Australia's MCM requirements.

3.4 In dealing with this reference the Committee noted that a number of the terms (see p iii) required an evaluation of the environment in which a mining campaign might be prosecuted against Australia. We also noted that such a process was similar to the methodology used by Dibb and the authors of the White Paper, in which the importance of the maritime environment and the potential for low level hostilities are seen as central to the ADF's force structure.

3.5 Accordingly, we have attempted to apply the same logical structure to our investigation of the particular capability of counter mine warfare as did the Dibb report and the Defence White Paper to the derivation of general policy. In dealing with the environment for the conduct of a potential mining offensive against Australia, we were mindful of the White Paper's analysis that an aggressor might choose to modulate the conduct of a campaign of low level hostilities in order to constrain Australia's options.[6] Therefore, to complement the treatment of the physical environment, we have attempted to evaluate elements of the political environment within which attempts to use mine warfare against Australia could take place.

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3. *ibid.*, p 24.
4. *ibid.*, p 25.
5. Dibb, *op.cit.*, p 125.
6. *The Defence of Australia*, p 24.

Physical Characteristics of the Australian Maritime Environment

Ports and Harbours

3.6 A striking feature of Australian ports is their variability. This is a function of Australia's size, and geographic and environmental diversity. From a mine layer's point of view this is important because environmental factors influence the effectiveness of mines and the ease with which MCM forces can neutralise a mining threat. As well as the characteristics of the natural environment, the mine warfare opportunities around Australian ports are shaped by commercial and other human activity. Littering of the harbour bottom and dredging are amongst those factors which can affect the operations of MCM forces.

3.7 The conditions at entrances to ports can be particularly important, because immediate offshore waters often represent the best location within which to damage shipping without overly exposing minelaying forces. Correspondingly, sea and bottom conditions in the approaches will influence the effectiveness of MCM forces.

3.8 In this regard the shallow approaches to many northern ports are significant, as they force most commercial vessels to enter via long narrow channels such as those at Port Hedland and Weipa, which are 27nm and 8nm long respectively.[7] In the case of Port Hedland the channel is in places as narrow as 183m[8], and its entrance is well outside the territorial sea. Sometimes the restrictions of narrow channels are significant

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7. Defence, *Submission*, p S349.
8. Port Hedland Port Authority, *Port Information*, December 1986, p 7.

features within ports. One example is the Port of Fremantle, where the 4nm of the Success and Parmelia Channels join the waters of the naval anchorage of Cockburn Sound to the sea exit. Both are narrow (152.4m) and restrict traffic to one direction.[9]

3.9 High variations in tidal ranges are also significant, both for their effects on navigation and for the difficulties they pose miners in selecting an effective depth for moored mines. The current generated by tidal changes tends to move a buoyant mine casing downstream and suppress it below the selected depth. For example, the maximum tidal range at Darwin is 7.92m with a mean of 3.72m[10], generating spring tides of up to 3 kts. Variations of the same order occur in other northern ports.

3.10 Even where the physical structure of a port is not significant, the weather in its approaches may be. Rough weather tends to reduce the effectiveness of MCM operations, reducing the margins of equipment performance even where the sea keeping of MCM vessels (MCMV) is adequate. Open water weather conditions can apply in the approaches to the majority of Australian ports, and even inside the harbours of some ports such as Darwin and Dampier.[11]

3.11 The Australian designed MHI is intended for operations in sea states up to 3, which the Committee was informed is weather equivalent to that experienced in Gage Roads during the America's Cup racing (Gage Roads also is one of the two main anchorages of Fremantle). In general, sea states 3 are equalled or exceeded in Australia's northern approaches some 50% of the time[12], whilst to the south Bass Strait experiences such conditions for 64% of the year.[13]

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9. Fremantle Port Authority, Letter, 7 March 1989.
10. Darwin Port Authority, *The Port of Darwin*, March 1988, p 16.
11. Defence, *Submission*, p S350.
12. Defence, *Evidence*, p 26.
13. Victorian Bureau of Meteorology, Letter, 5 April 1989.

3.12 In contrast, conditions at the south eastern ports are generally less extreme. At Sydney, for instance, the maximum tidal range is 1.6m, the harbor's average width is 1.5 km, half its 5500 hectares are not less than 9m in depth and both of its independent shipping channels have a minimum depth of 12m, capable of handling vessels in excess of 100 000 tonnes.[14]

3.13 This does not necessarily mean that the threat to shipping from mining would be reduced in such a harbour, but rather that the nature of a miner's campaign would have to be different as, correspondingly, would be the response of MCM forces. From the viewpoint of planning a mining campaign, the problem of large open harbours like Sydney is that they are difficult to close by mining without a major effort, which has attendant risks to the layer.

3.14 Some possible problems concerning entrances to ports in the south east have been cited to the Committee, mostly concerning the width of developed or artificial harbours. The entrances to both Newcastle and Port Kembla are between artificial breakwaters, with widths of 185m[15] and 305m[16] respectively, and the opinion of the Maritime Services Board of NSW is that the sinking of a vessel at the entrance could close those ports for many months.[17] Since that region contains four major international ports in less than 180nm and the most extensive infrastructure in the nation, considerable options exist for re-routing traffic and commerce should one of those ports be blocked. MCM in that particular environment therefore may largely be a matter of pre-planning and organisation.

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14. Maritime Services Board of NSW, *NSW Ports Handbook 1988*, Melbourne, 1988, p 37.
15. *ibid.*, p 55.
16. *ibid.*, p 63.
17. Maritime Services Board of NSW, *Submission*, p S3.

3.15 However, in other regions the closure of ports could not be circumvented, either because they are located on islands or are not adequately connected to the national transport infrastructure. For example, the island ports of Groote Eylandt and Barrow Island ship significant quantities of manganese and oil; most of the northern mineral ports have poor land connections; while the length of the sealed roads connecting Darwin and the Pilbara ports is measured in only hundreds of kilometres, and does not provide an economic alternative to the movement of bulk mineral prime commodities. (A possible exception is uranium oxide, of which shipments from Darwin in 1986-87 totalled 4000 tonnes.[18])

Coastal Waters and Focal Points

3.16 The Department of Defence presented evidence to the Committee that the 90m depth contour of coastal waters is a significant environmental factor affecting the conduct of mine warfare. In greater depths the effectiveness of ground mines is marginal. Closer inshore, the 30m contour marks the limit of practical effectiveness for small ground mines.[19] As the attached map illustrates (Figure 3.1), all of Australia's coastal trade routes, except for the crossing of the Great Australian Bight, are located within waters less than 90m. Both Bass and Torres Straits are within the 90m contour. With the exception of traffic in the Great Barrier Reef, it is only in the approaches where shipping transits waters of 30m or less.

3.17 However, in many cases the danger of mining in coastal waters can be avoided. The distance from the NSW ports to the 90m contour is generally less than 10nm,[20] so coastal shipping could be routed to seaward in the event of a mining alert. The waters from Portland westward are similarly unobstructed.[21]

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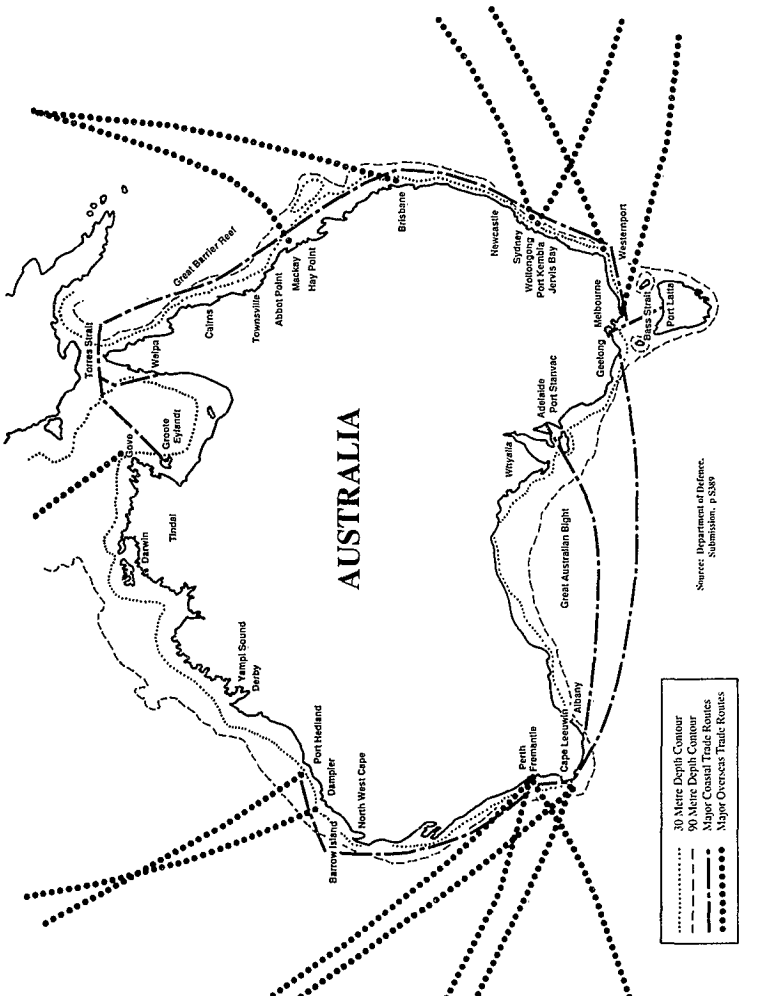
18. Department of Transport and Communications, *Port Authority Cargo Movements*, 1986-87, AGPS, Canberra, 1988, p 302.
19. Defence, *Submission*, pp S388-90.
20. *ibid.*, p S390.
21. *ibid.*, p S389.

Figure 3.1 : DEPTH CONTOURS AND MAJOR TRADE ROUTES



3.18 The situation is less favourable in the north and north west, where in some cases shipping routes are confined due to limitations of charting. However, Defence's advice to the Committee is that the areas of highest shipping convergence are unconstrained. The most effective procedure available to a miner to overcome the vast distances around the Australian coast - namely, laying mines in the advertised shipping routes near convergence points such as North West Cape and Cape Leeuwin - can therefore be overcome by re-routing shipping.[22]

3.19 The problem is more acute in the case of choke points created by straits and reefs. The exception is Bass Strait, which is wide and relatively unobstructed, to the extent that its closure would require fields in the order of thousands of mines.[23] Shipping transiting Torres Strait is limited to a few narrow channels. Further, the Strait has changeable bottom conditions, with tides and currents tending to move the bottom sediments in wave-like patterns. Recent research aboard HMAS COOK has indicated that these phenomena can be up to seven metres in height and create a burial cycle of 31 days in every 128.[24] Whilst this feature could complicate a direct campaign of mining aimed at shipping, it could assist an opponent with other objectives, say the tying-up of RAN MCM forces.

3.20 The Great Barrier Reef is another area of coastal waters whose characteristics could assist an intending miner. The reef constricts the exits to the open sea of a number of significant ports such as Gladstone, Hay Point, Abbot Point, Mackay, Cairns and Cape Flattery. Both the channels and the passages within the reef are mineable[25] and most of its navigation routes lie in water less than 30m deep. The effectiveness of lighter mines at these depths may well

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22. *ibid.*, pp S372-74.
23. *ibid.*, p S360.
24. 'Large sandwaves can bury mines', *Navy News*, 16-30 September 1988, p 6.
25. Defence, *Submission*, p S371.

increase the opportunities for the successful clandestine mining of shipping routes. The fact that routes are constricted and defined by the reef system may encourage sporadic mining not profitable in open waters, whilst the sheer length of the 1000 miles of navigation routes within the reef[26] could severely strain the deployment capacity of any MCM force.

Neighbouring Archipelagos

3.21 Australia's access to east and south east Asia is constricted by the chain of islands to our north and north east. Commercial shipping (and air traffic) must pass through the archipelagos to reach major trading centres such as Singapore, Taiwan, Korea and Japan. This involves transiting straits from the Sunda in the west to St George's Channel between New Britain and the Solomons in the east, and passing through various enclosed seas, particularly the Java, Banda, Bismarck and Solomon.

3.22 Current defence policy recognises that threats to Australia's trade could arise in this area, but does not appear to consider that a military solution might be sought:

> Important Australian trade passes through choke points in the archipelago to our north and these passages could be denied to us even during lower levels of conflict. In those circumstances, there would be options for re-routing shipping clear of the archipelago. Economic costs would be involved which, without Government subsidy, could adversely affect the competitiveness of our exports that normally pass through the archipelago. Again, the cost to Australia would reflect itself in reduced living standards and economic impact on some regions of the country, rather than a threat to national survival.[27]

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26. *ibid.*, p S372.
27. *The Defence of Australia*, p 28.

3.23 The prospect of Australian naval forces taking a more active role in this area appears to have been under consideration recently. In the context of Australia's ability to control its maritime environment, the Minister for Defence has stated that priority should be accorded to protecting our sealines of communication. Concluding that attacks in the open ocean required naval capabilities not present in the region, he nevertheless noted the number of focal points in the island chain to our north where 'disruption could occur, even in lower levels of conflict'.[28] Specifically mentioned were the straits through the Indonesian Archipelago and the choke points around Papua New Guinea, the Solomons and Vanuatu.

3.24 The general thrust of that speech suggests that the Minister was talking primarily about 'disruption' caused by conventional naval surface forces. The Committee believes that the threat of mining must also be considered, both for the safety of RAN vessels and because an opponent could consider mining an effective adjunct to, or substitute for, a more open attack on commercial shipping.

3.25 An extrapolation of the 90m water contour to some of the archipelagic waters indicates that Sunda Strait and the eastern half of the Java Sea are suitable for the use of ground mines. The close-in southern approaches to Timor, and the passages between the Solomon and Bismarck Seas appear capable of being mined but, because of their depth, only with moored mines.[29] The other straits through the archipelago and the focal points around the Louisiade Archipelago and New Ireland, with the exception of China Strait, appear too deep for mining by any but the most advanced technology mines.

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28. Kim Beazley, *Australian Defence Policy*, Conference Paper, 9 December 1988, p 14.
29. Defence, *Submission*, p S389.

The Commercial Environment

Australian Maritime Trade

3.26 The nature and volume of Australian trade moved by sea provides an opponent with a range of options for placing pressure on Australia militarily, economically and politically. There are also, however, constraints on the way in which a potential miner could use the weapons. For all practical purposes, once laid, mines will not discriminate between international and coastal shipping, yet it may be the miner's intention to target one and not the other, or indeed to seek to damage only a particular trade. In such circumstances, an aggressor would have to plan his operation accordingly. An accurate analysis of his options should provide the ADF an insight into the appropriate countermeasures.

Overseas Shipping Trade

3.27 Australia's overseas commodity trade is dominated by shipping, which in 1986-87 (the last financial year for which figures are available) carried some 78% by value of imported commodities and 86% by value of exported commodities.[30] In that year, the $31 148m of goods exported by sea represented 12% of GDP. In terms of volume the dominance of sea transport is complete, being 99.9% by weight of exported commodities. The most important defined category of imports, both by sea and air, during 1986-87 was machinery and equipment, as shown in Figure 3.2. In the export trade coal, metal ores and textiles

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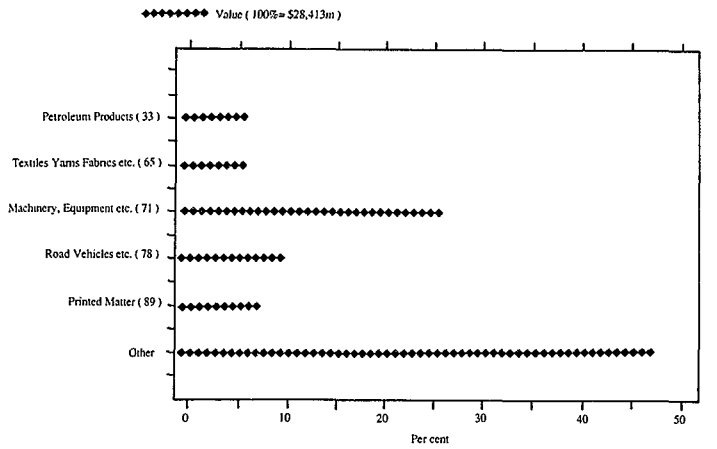
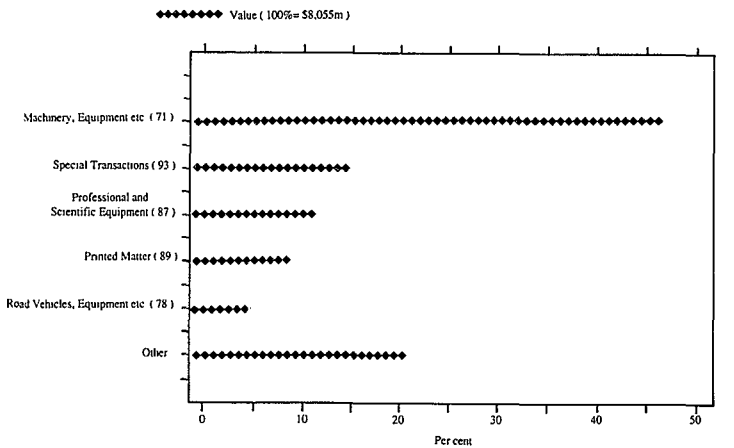
30. Analysis of overseas trade in this section is drawn from the data in: *Shipping and Air Cargo Commodity Statistics, Australia*, September Quarter 1987 and 1986-87, Australian Bureau of Statistics, Canberra, 7 October 1988.

Figure 3.2: VALUE OF INWARD OVERSEAS SEA CARGO BY COMMODITY (ATFCC DIVISION) 1986-87

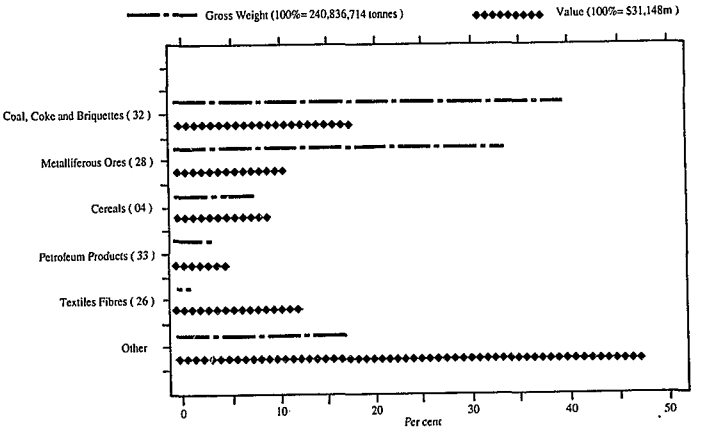


VALUE OF INWARD OVERSEAS AIR CARGO BY COMMODITY (ATFCC DIVISION) 1986-87



Source: ABS, Shipping and Air Cargo Commodity Statistics, 1986-87

Figure 3.3: GROSS WEIGHT AND VALUE OF OUTWARD OVERSEAS SEA CARGO 1986-87



Source: ABS, Shipping and Air Cargo Commodity Statistics, 1986-87

continue to dominate earnings, but the disproportionate effort of moving coal and ore, as represented in Figure 3.3 by the difference in the proportions of gross weight lifted and value, is indicative of its comparatively low unit value.

3.28 The characteristics of commodities imported and exported are such that the import trade is dominated by tankers (10.1 million gross weight tonnes delivered, some 43% of the mass of imported commodities) and the export trade by bulk carriers (219.5 million tonnes loaded, more than 90% of the mass of exports). This trade tends to be concentrated in certain areas, with tanker trade predominating around refining centres and bulk carriers at major resource projects. Fremantle takes over 20% of liquid bulk imports, whilst four ports - Sydney, Botany Bay, Geelong, and Port Stanvac - each takes more than 10%.[31] Together, these five ports accounted for almost 75% of bulk liquid imports in 1986-87. Four ports (Newcastle, Hay Point, Dampier and Port Hedland) each exported over 30 million tonnes of bulk coal and iron ore, accounting for 60% of all dry bulk export cargoes in 1986-87.

3.29 However, in terms of value of commodities traded, the situation is different and the role of general cargo ships can be seen to be more important. Some $22.4 billion worth of commodities was imported by this means in 1986-87, almost 80% of the total value. By contrast, less than 7% of the total value of imports was accounted for by the tanker trade. General cargo ships also have an important role in the export of commodities, moving about 45% ($14.2 billion) of the total value of Australian exports, a figure only marginally less than the $15.1 billion value of the bulk export trade. These patterns of volume and value of trade are illustrated in Figure 3.4.

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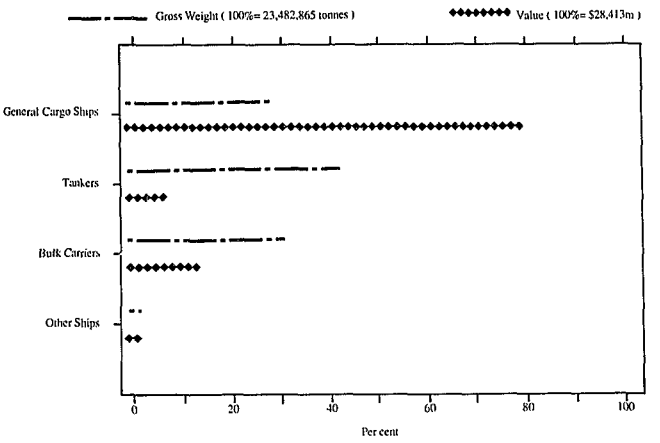
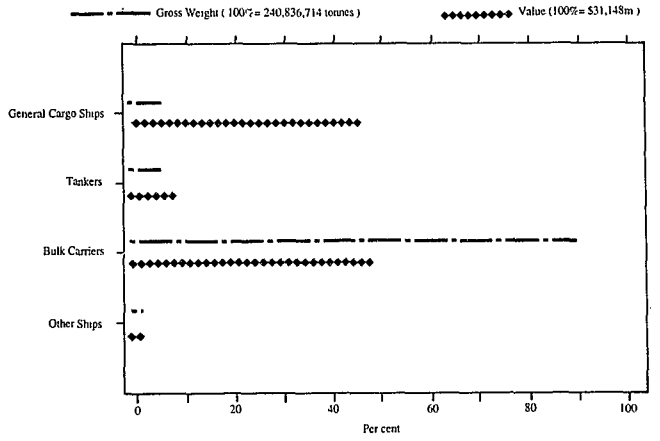
31. This section is calculated from data in *Port Authority Cargo Movements*, Table 7, 'Cargo movements through Australian ports, by port, by commodity and nature of voyage 1986-87', Department of Transport and Communications, 1988, pp 26-308.

Figure 3.4: GROSS WEIGHT AND VALUE OF INWARD CARGO BY SHIP TYPE 1986-87



GROSS WEIGHT AND VALUE OF OUTWARD CARGO BY SHIP TYPE 1986-87



Source ABS, Shipping and Air Cargo Commodity Statistics, 1986-87

3.30 Viewed in terms of value, the importance of certain ports to the national economy appears different from the impression created by the nature of the trade. Sydney and Melbourne dominate the import trade, with imported commodities landed there ($22.2 billion) being almost 80% of the total value of sea borne imports in 1986-87.[32] Brisbane and Fremantle each unloaded 5% of the value of sea-borne imports, but no other port handled more than 2%.

3.31 Contribution to the carriage of exports is more broadly based but, again, Sydney (12%, $3.6 billion) and Melbourne (19%, $5.8 billion) were the only ports to contribute more than 10% to the value of commodities exported by sea in 1986-87.[33] Fremantle was the next in rank, exporting 9% of the value of sea-borne exports but, of the great bulk ports, only Newcastle was significant, contributing 8% of exports shipped in 1986-87. From the other bulk ports mentioned above (Hay Point, Dampier and Port Hedland), the proportion of total exports shipped was 5%, 3% and 2% respectively. Indeed, in terms of the value of commodities shipped, Gladstone was only fractionally behind Hay Point, and Westernport and Townsville ranked above Dampier and Port Hedland.

3.32 In terms of unit effort it is not surprising that the pattern of ship movements through ports tends to follow the comparative value of commodities traded through those ports. Melbourne and Sydney accounted for 12.7% and 10.3% (2931 and 2377 movements) of the total of 23 120 ship movements in the Australian international trade in 1986-87.[34] Fremantle was the third most frequently visited port with 2126 movements, almost

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32. Based on data from ABS printout of SACCS Imports 1986-87, 8:12:87.
33. Based on ABS printout of SACCS Exports 1986-87, 8:11:88.
34. ABS, *Shipping and Cargo Australia*, June Quarter 1987 and 1986-87, Canberra, December 1987, Table 20, 'Overseas Ship Arrivals and Departures at Australian Ports', 1986-87, p 33.

10% of the total. Of the bulk ports, Newcastle, reflecting its more varied trade, handled 1525 ship movements, more than two thirds greater than those of Dampier (893), the next busiest of the bulk ports in 1986-87.

3.33 It should be noted that the figures for 1986-87 will reflect influences which may not be replicated subsequently, and that the nature of Australia's trade is changing over time. Between financial years, fluctuations in the international economy will affect prices and volumes of sales of primary products, and the competitiveness of the Australian economy will influence the composition of commodity exports and the nature of imports. These and other factors will affect the comparative value of trade flows through various ports in any particular year. The Committee does not have the resources to produce long-term predictions of trends in the economy's trading sector, and its analysis must therefore rely on the latest data.

3.34 However, the major characteristics of Australian international maritime trade appear sufficiently established to remain in place for some time. Sydney and Melbourne are clearly the most important ports in Australia, both as entrepots and export points. The liquid bulk trade absorbs much capacity and is highly concentrated, but has less financial significance. Newcastle is important as the centre which contributes most to bulk export earnings, whilst Fremantle contributes a lesser but substantial proportion to both export and import movements. Whilst the volumes of shipping through the southern ports does not exactly correspond with their dominance in earning capacity, they are clearly the busiest. However, and in keeping with the sheer mass of bulk mineral exports, the northern coal and ore ports handle significant numbers of vessels each year.

Coastal Shipping

3.35 Coastal shipping has been a declining transport mode for some decades as the nature of the internal economy has changed and the requirements of shippers have been modified correspondingly. Between 1973-74 and 1986-87 the coastal trade for non-bulk freight declined by 60%, so that today the entire coastal shipping fleet numbers only 61 vessels over 1000 tonnes. Seventeen of those ships are also engaged on overseas trade. Nevertheless, in important sectors of the economy coastal shipping remains crucial, providing the only means of moving bulk cargoes over long distances.[35] Further, should existing inefficiencies arising largely from restrictive work practices be removed, there is the potential for the system to be more important. For all heavy freight, shipping provides the only means of trade to and from Tasmania.

3.36 Coastal shipping is estimated to carry 3% of the total tonnes transported in Australia, but its importance to distance transport is illustrated by the fact that it carries 37% on a tonne-kilometre basis. This is primarily due to the fact that resource feed stocks are located at considerable distances from established processing facilities. Hence 97% of all coastal shipping tonne-kilometres is performed by bulk carriers. Of this, dry bulk transportation is the major task, comprising 68% of tonne-kilometres, although the cargo amounts to only 51% by weight.

3.37 Much of this trade is concentrated by industry, operator and port. Iron ore and bauxite generated 82% of the dry bulk coastal shipping activity in 1985-86. Of the 68.6 billion tonne-kilometres of dry bulk freight carried by coastal shipping in that year, 41.3 were iron ore and 15 bauxite. Those figures constituted 40% and 15% respectively of the total

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35. *Industries Assistance Commission, Coastal Shipping,* July 1988, p iii. Except where otherwise stated, the data for this section are drawn from this source.

coastal trade of 101.8 billion tonne-kilometres.[36] In terms of mass, the totals were 7.6 and 6.6 million tonnes constituting 17% and 15% of the total of 44.7 million tonnes lifted in that year.

3.38 Iron and steel production, therefore, is clearly the biggest generator of transport demand in Australian coastal shipping. Practically all of this effort was mounted by a single operator. The transport from north western ports to BHP's Newcastle and Port Kembla steel works of 7.2 million tonnes of iron ore accounted for 40.5 billion tonne-kilometres. The great majority of this traffic originated in Port Hedland, which shipped 4.7 million tonnes of iron ore to Port Kembla in 1986-87. This compares with 1.4 million tonnes from Yampi Sound (mostly to Port Kembla), and the Whyalla and Port Latta (Tas) shipments each of only around the half million tonne level of ore composites.[37] The bauxite trade is even more concentrated, with 80% of the bauxite shipping attributable to the 12 billion tonne-kilometres of ore transported from Weipa to Gladstone. No other component of the coastal trade in dry bulk cargo generated more than 2.4 billion tonne-kilometres or lifted more than 1.2 million tonnes.

3.39 This situation obtains because the specialised areas of the dry bulk trade are being undertaken by increasingly large vessels, and the total of 31 bulk ships is not a great number in the context of the huge distances which the majority of them cover. The companies involved plan their operations to maximise economies of size and efficiency in routing. For example, BHP Transport prefers to increase the distances sailed by 6 of its 15 vessels in order to gain economies through lessening the proportion of time steamed in ballast. Thus a typical round trip might involve sailing from the Australian east coast to Japan with coal, and thence back to the Pilbara for the next load of iron ore to NSW, where coal would again be loaded.

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36. For further details see IAC, *op.cit.*, Table G.1, p 263.
37. Department of Transport and Communications, *op.cit.*, Table 7.

3.40 The only other area of the coastal shipping trade where the same pressures of distance and bulk produce a large transportation effort is in liquid bulk trade, principally that for petroleum products. Indeed, the 11.4 million tonnes of refinery feedstock moved in 1985-86 was the largest single trade on the coastal route and comprised 25% of all coastal cargoes by weight. However, because the distances from source (particularly the Bass Strait fields) to refinery are shorter than the dry bulk trade, the transportation task involved was proportionately less at 20.7 billion tonne-kilometres, 20% of the total for coastal shipping. A further 6.2 million tonnes of refined petroleum products was transported in 1985-86, the fourth largest component of the coastal trade and almost equal to the weight of bauxite carried.

3.41 These two categories account for almost all of the bulk liquid trade of 18.3 million tonnes lifted in 1985-86. In all, the total mass of bulk liquids comprised 41% of all coastal trade by weight, and the transport effort involved was 29.2% of all tonne-kilometres. The transportation of crude oil is also a concentrated trade, though not to the extent of the dry bulk trade. The most significant port in the crude oil trade is Westernport, which shipped 8.1 million tonnes interstate in 1986-87, compared with 0.6 million from Barrow Island.[38] The trade in refined product was more dispersed, but involved the same ports which feature in the international petroleum trade.

3.42 Because of the shorter distances between the main resource and the refineries, the number of coastal tankers is significantly smaller than the dry bulk fleet, with only 15 vessels employed full-time on the coastal trade. Of these, only

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38. Department of Transport and Communications, *op.cit.*, Table 7.

2 are used exclusively for the carriage of crude oil, 7 for the carriage of refinery products, and 3 for the transport of both categories.[39] As might be expected the product carriers are considerably smaller than the crude oil or dual purpose carriers and, like the dry bulk carrier fleet, all types are operated and mostly owned by the petroleum companies which process and distribute the oil products.

3.43 Perhaps the most significant of coastal shipping's general cargo trades is the transportation of iron and steel. This is not simply because it is the dominant non-bulk cargo (with 1 million tonnes shipped in 1985-86, compared to 100 000 tonnes for motor vehicles, the next category), but because it comprises a trade which integrates domestic with export industry. Almost half a million tonnes of refined steel product was transported from Port Kembla to Westernport in 1986-87[40] to feed Melbourne's manufacturing sector and, in turn, to contribute to exported commodities. In this way the iron and steel industry involves a complex maritime transport system in which the importance of any particular port should be assessed by its contribution to the refining process as a whole, and not solely by the statistics of its individual trade.

Offshore Oil and Gas Production

3.44 Although not themselves part of the shipping environment, the offshore oil and gas rigs around the Australian coast are dependent upon rig support vessels for support and the delivery of heavier stores. The most extensive

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39. IAC, *op.cit.*, Table G5, 'The Australian Coastal Fleet: June 1988', p 267.
40. Department of Transport and Communications, *op.cit.*, Table 7.

and productive of these rigs have been those in the Bass Strait/Gippsland fields, which produce 471 600 barrels per day (89% of indigenous production); whilst the Jabiru field in the Timor Sea produced 25 000 and Barrow Island 20 000.[41] This and other production of petroleum feedstock is estimated to save Australia foreign exchange outlays of $4 billion annually.

3.45 Further exploratory work is continuing in the Timor Sea and other offshore locations, and two new fields are entering production: the Challis field in the Timor Sea and another group near Barrow Island. The implication of current exploration is that the north west offshore oil industry will grow (as the Bass Strait fields decline) and that the strategic significance of the two areas will come into balance.

3.46 This trend will be accelerated by the development of offshore gas extraction, with the North West Shelf Natural Gas Project currently Australia's largest resource development at an estimated cost of $12 billion. Of these, North Rankin A is the largest production rig of its type in the world. Already, half of Western Australia's non-automotive energy is supplied from these gas fields, with future development projected to lie in the export of energy (by tanker, as liquid natural gas), particularly to Japan, and becoming significant in the 1990s. Further development of this export industry is being evaluated, principally in the Amadeus and Bonaparte Basins.

3.47 Most of these facilities are a considerable distance out to sea. North Rankin A is 140km NNW of Dampier, whilst the Jabiru field is 600km west of Darwin. Both are in waters susceptible to mining, although Rankin is connected to the

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41. The data for this section are drawn from W A G Dovers, *Australia's Maritime Activities and Vulnerabilities*, Stategic and Defence Studies Centre, Canberra, 1988, p 30.

mainland by a pipeline. The Jabiru field, however, is tapped by a converted tanker which moors to the well-head and discharges over the stern to other tankers. The most common shipping to offshore rigs are the support vessels which usually call two or three times a week. There are 49 such vessels on the Australian coast.

Opportunities and Limitations in the Commercial Environment

3.48 Whilst the nature of Australian maritime trade presents many opportunities for offensive mining, the task nevertheless would be a complicated one. If creating the maximum economic damage to the nation by mining were an opponent's objective, the two ports which would have to be attacked would be Sydney and Melbourne. Yet both are distant from any possible base of operations and are near ADF force elements which should make laying and maintaining a mine field dangerous.

3.49 There may be much to recommend mining of the northern resource ports, but their contribution to the economy, whilst important, is not as vital as might be at first supposed. In many cases their entire product is exported, and the risk of antagonising a third nation, which could possess considerable influence, would have to be weighed by the miner. This situation may change in the future if the north west shelf becomes as great a source of energy as appears possible. At present not many targets present themselves (primarily rig

support vessels) but, should the export of LNG from Dampier become a major industry, both the number and value of targets will increase significantly. However, the miner would still have to evaluate the consequences of inviting foreign intervention by mining an energy exporting port. Further, since 96% of Australian overseas maritime trade is conducted by foreign owned vessels, the problem of foreign response would demand consideration. Any action which could involve foreign shipping might perhaps require some preliminary diplomatic safeguards, which in turn could carry the risk of providing advance warning to Australia.

3.50 The secrecy required by a covert campaign could be difficult to maintain at many of the resource ports. Such factors as private port ownership, specialised berthing facilities and radar surveillance of shipping channels could all inhibit minelaying. On the other hand, a general entry port such as Darwin, which hosts more then 150 foreign fishing boats a year,[42] could be more vulnerable to a clandestine mining campaign. Yet Darwin is a comparatively minor trading port.[43] Thus, mining Darwin would be of little value if the aggressor's objective were to maximise economic damage to Australia.

Economic Losses Caused by Mining

3.51 In its submission to this inquiry, the Department of Defence provided data on the loss which could accrue to the export trade if certain ports were each to close for one month; that information is at Table 3.1.

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42. 171 in 1987-88; Darwin Port Authority, *Shipping statistics*, 1987-88.
43. ABS, SACCS Exports, SACCS Imports, 1986-87.

TABLE 3.1: LOSS OF EXPORT EARNINGS

Ports	Export Value $m	% Total Aust Export Value (monthly)
The Pilbara Iron Ore ports (Dampier, Port Hedland and Port Walcott)	145	5.6
Hay Point (mostly coal)	130	5.0
Gladstone (mostly alumina, aluminium and coal)	124	4.8
Townsville (mostly raw sugar and minerals)	70	2.7
Mackay (mostly raw sugar)	39	1.5
Gove/Groote Eylandt (mostly alumina bauxite and manganese ore)	29	1.2

Source: Department of Defence, *Submission*, p S365.

3.52 Closure of ports for extended periods could result from physical damage caused by mining (sinking a ship in a narrow channel), or from the RAN's inability to survey and declare safe a number of ports which have been (or said to have been) mined. Should the lack of an MCM capability dictate a more extensive closure, the delay would multiply the losses of productive effort involved. Studies conducted for the Navy have concluded that closure of the Pilbara ports for three months would cost the economy almost $500m, Weipa and Gove $50m and $85m respectively, and Groote Eylandt $23.6m, in 1984-85 values.[44]

3.53 Other submissions have noted the direct cost of shipping losses which can result from mine damage: costs in the Persian Gulf, for example, have been estimated at between $30m and $62m.[45] As well as ship repair or replacement costs, the loss of the cargo should a vessel be sunk could be considerable. At, say, $20 a tonne for iron ore, the loss of cargo aboard a bulk ship such as IRON PACIFIC (231 850 dwt) would amount to more than $4.5m. Added to this would be the cost of the replacement vessel, estimated by BHP Transport as $68-70m.

3.54 It is hard to determine in precise terms the effects that a major disruption to the economy from losses incurred to domestic and international trade would produce. The effects on particular sectors might be severe. For instance, were the sinking of an iron ore carrier to block the channel at Port Hedland, and the port to be closed for months, shortages of iron ore at Port Kembla might lead the steel industry there to close its blast furnaces. As well as the financial losses involved, such an outcome could produce regional economic and social difficulties, such as unemployment, on a significant level.

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44. Department of Defence, Directorate of Naval Force Development, *Coastal Shipping - Its Importance to the Economy,* August 1987, p 6-1.
45. Hinge, *Submission,* p S277.

3.55 However, in national economic terms, the effect of possible losses caused by a mining campaign should not be economically crippling. The worst case scenario above, namely, closure of the Pilbara ports for three months, would have resulted in the loss of less than 0.25% of the 1984-85 GDP. Whilst an event of those proportions would impact on other sections of the economy, and undoubtedly have consequences on many levels, from the value of industrial production to the size of the public sector budget, it would not prove unsupportable.

3.56 Indeed, similar losses have been sustained by Australia in the past with little direct strain being exhibited outside the region in which they were incurred. The Brisbane floods of 1974 were estimated to have cost $100m and Cyclone Tracy $500m.[46] That last figure represented 2.9% of 1974-75 GDP but was eventually made good without its impact placing a noticeable burden on the Australian community or polity.

3.57 There remains one little-considered source of loss as a result of a mining campaign against Australian trade. In the present economic climate of unregulated financial markets, many events have been seen to affect the value of a nation's currency, but little consideration appears to have been given to the effects of military aggression on the value of an unregulated currency. Were that aggression to be aimed at areas of particular concern to the market, such as the export trade or the iron and steel operations of BHP, one of the results could be a devaluation of the currency out of proportion to the costs of any damage inflicted.

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46. R H Leicester & G F Reardon, quoted in 'Study of Wind Damage', *Canberra Times,* 31 May 1976.

3.58 It might be expected that the market would self correct, but it cannot be assumed that it would do so at an early date, particularly when the threat is as difficult to quantify as is the case with mine warfare. Neither would the results of such a devaluation be easy to predict, as they would depend on the nature and duration of hostilities. For instance, the Argentinean Peso fell 18% in value against the $US between April and May 1982 with the opening of the military campaign in the Falklands War. This, however, was insignificant compared to the fall in value of over 120% between June and December, during the political chaos that followed the loss of the war.[47]

3.59 This is not to suggest that the same effects on the value of the $A would be induced by a mining offensive against Australian trade, or that involvement in such a dispute would produce the social and political strain which had been endemic in Argentina before the conflict with Britain. Nevertheless, if accompanying a protracted dispute, the macro-economic effects of hostile action might be the most significant way in which the majority of citizens would be affected by a mining campaign.

3.60 In some circumstances the remoteness between cause and effect could influence community perception of a dispute, and might restrict the political environment within which the Australian government would be working. Such problems have not yet become the subject of much study, official or otherwise,[48] but are important in considerations of low level conflict, especially where the defending side is attempting to maintain normal economic activity. The weight of evidence presented to the Committee indicates that mine warfare represents one of the

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47. US Federal Reserve Bank, *Federal Reserve Bulletin*, International Statistics, July 1982, January 1983, Table 3.28.
48. Paul Lee, Masters Dissertation in Preparation, ANU, 1989.

more productive methods of bringing pressure to bear on a nation's economic processes whilst restricting the threat to the aggressor to a minimum level, thus extending the period over which economic difficulties may test the patience of the targeted nation.

Foreign Involvement

3.61 A significant consideration for a potential miner of Australian waters is the fact that most of the cargo shipping is foreign owned. Only 4.3% of the gross weight tonnes of freight exported by sea in 1986-87 was in Australian owned vessels, while only 3.8% of total ships departing were locally owned: numerically, this amounted to 244 overseas departures by Australian vessels from a total of 6507.[49]

3.62 Of the foreign owned vessels trading with Australia, the most numerous were Japanese, with 1206 departures representing 18.5% of all such traffic. Some 1500 departures were made by ships under the 'flags of convenience' of Panama and Liberia, but the next most active of the 'national' flag vessels were those of regional nations, with 340 departures of ships from each of China and the Philippines being recorded. Together, some 2562 ship departures, or almost 40% of the total, were made by vessels registered in the nations of east and south east Asia.[50]

3.63 The foreign domination of Australia's overseas maritime trade may well place limitations upon a potential mining campaign, depending upon the objectives of that campaign. The Defence submission noted that this fact would

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49. ABS, *Shipping and Cargo Australia, June Quarter 1987 and 1986-87*, 23.12.1987, Table 24, 'Overseas ship departures by country of registration and cargo loaded, 1986-87', p 39.
50. *ibid.* This is the total of named countries; in fact the proportion would be higher if the 'other countries' category of the table were itemised.

constrain an opponent who wished to limit the dispute and avoid international involvement arising from the harassment of shipping. However, the submission also noted that this constraint would diminish as the situation deteriorated.[51] The number of vessels from regional countries involved in Australia's international trade, and which would therefore be at risk, may also provide direct diplomatic levers (through organisations such as ASEAN or the investment exposure of nations like Japan or the Republic of Korea), which could be used by the Australian government to influence the outcome of a dispute which had deteriorated to the point of mine warfare.

3.64 Other studies have suggested that the persistence of this level of restraint may not be very great. Since 1970 neutral shipping has been diverted or damaged, and some eight vessels sunk, with little effective intervention from the governments of the flag states.[52] In the Persian Gulf there were over 300 attacks on shipping during the seven years of the Iran-Iraq war, before the threat of extensive mining finally brought international action for the protection of shipping.[53] The effectiveness of international pressure in limiting a mining campaign against Australia, therefore, should not be taken for granted. However, should this consideration form part of an opponent's planning, there remains a number of ports, such as Barrow Island, where the only regular shipping is domestic and the trade is sufficiently significant to warrant targeting.

3.65 Yet another consideration raised by the level of foreign involvement in external trade is the possibility that hostilities may be directed at the vessel and not at the Australian cargo. It would seem more likely that action would take place in the straits and archipelagic seas to the north,

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51. Defence, *Submission*, p S354.
52. D P O'Connell, *The Influence of the Law of the Sea*, quoted in W A G Dovers, *op.cit.*, p 30.
53. *loc.cit.*

but terrorist style action, including clandestine mining of a port regularly visited by the vessels of the nation targeted, or a high visibility target such as an LNG shipment point, is a possibility. Whilst this type of action is too limited in scope and potential to drive policy, the threat of attack to shipping in northern waters means it must still be taken into consideration at the level of contingency planning.

3.66 If, as the Minister for Defence has recently stated, the protection of sealines of communication running through the Indonesian and Melanesian archipelagos commands attention in defence planning, then mine warfare must be a central element of that planning. The fact that 51% by value of Australia's maritime exports go through, or to, the archipelagos makes security of passage through them a direct Australian security concern. Because the vessels carrying this trade are foreign owned (and 40% of the total carrying Australian exports come from nations of east or south east Asia) it could be the case that any attacks on shipping would result from some regional dispute involving those nations and not Australia. From the viewpoint of Australian interests, however, there is no logical distinction between the cargo and the 'package' carrying that cargo.

3.67 In general, therefore, the reliance of Australia on foreign owned vessels for its international maritime trade introduces a number of complicating factors into the consideration of Australia's MCM requirements. Those factors make it difficult to determine the size and nature of an appropriate counter mine warfare force. There are also political aspects of the mine warfare equation which can be used to complicate the problem still further.

The Political Environment of Mine Warfare

3.68 Consideration of the political aspect of the MCM problem is necessarily more speculative than other areas of the Committee's investigation, as it deals with elements of the threat situation which are difficult to predict and can change quickly. Because of the unpredictability which political factors introduce to the analysis of strategic circumstances, policy and contingency planners usually attempt to identify environmental and technical criteria which remain constant and are as little influenced as possible by political considerations. In reality, however, most conflicts since WWII have seen one or both protagonists try to advance their strategies by the use of political pressures.

3.69 The political factors which concern this report are two-fold. First, there is the traditional problem of national defence planning, namely, the lack of warning for changes of intent on the part of powers which might threaten national security. Second, there are those types of action which can be used by either party to gain the initiative in selecting the level of force used and the theatres of its use. Mine warfare provides techniques and capabilities which can readily meet the requirements of each of those factors. This versatility is largely due to the independent activation of mines, which allows the miner to control his overt involvement in an operation and to inflict damage on opposing forces, whilst minimising the damage to his own forces by ensuring their absence at the time of action.

The Options of the Mine Layer

3.70 As was detailed in Chapter 2, the deployment of mines is made comparatively easy by their availability and the variety of means available for their deployment. The most effective deployment of a mine field requires experience, good intelligence and careful planning. However, as recent operational use of mines has shown, even poorly planned or deployed minefields can cause significant problems. Assessments are that limited stocks of mines are already available within our region but, as was also pointed out in Chapter 2, mines could be manufactured comparatively easily, either as separate systems or by modifying aerial bombs with 'destructor' conversion kits.

3.71 In addition, the commercial interests and diplomatic objectives of major industrialised nations make it feasible for potential opponents quickly to acquire the more sophisticated types of mine,[54] whilst the inventories of non-national arms dealers could supply terrorist groups with effective mines. The prospect of the ADF facing weapons drawn from allied sources is acknowledged in the White Paper:

> Our defence planning recognises that in some circumstances our forces could face an adversary using materiel of Western origin. This would demand the development of specific capabilities for our own equipment.[55]

3.72 The factor which makes the commercial availability of mines particularly significant is their comparative ease of deployment. According to circumstance and objective, this can be done from almost any platform. Hence, developing doctrine

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54. Defence, *Submission*, p S322.
55. *The Defence of Australia*, p 70.

for, and training personnel in, their use can be generalised and not necessarily restricted by a requirement for specific equipments.

3.73 This can be coupled to a procurement lead time for operational weapons significantly shorter than that for acquiring effective countermeasures. Thus, mine warfare has attractions as the means for an early use of force should unforeseen events ever lead to suddenly growing hostility towards Australia. It also represents one of the few means of circumventing the warning of threat normally supplied by our technological intelligence.

3.74 In some circumstances, the opportunity to secure an advantage over the ADF could be part of a conventional battle strategy, such as the deployment of mines at RAN bases to slow naval deployments after the commencement of open hostilities. However, the second half of the 20th century has seen few such conflicts and, as most of those which have occurred have involved forces of disproportionate military power, they have been characterised as much by dependence upon non-military devices as upon combat between forces. Basically, this type of 'limited' conflict has involved attempts to manipulate the circumstances of combat, and the perception of any fighting that takes place, in order to achieve a favourable outcome.

3.75 The use of mines presents many opportunities for an opponent to manipulate the conduct of a dispute with Australia. International legal convention would probably dictate that, at the outset of a campaign, mines would be laid clandestinely. Even though there is recognised justification for overt mining (but apparently none for covert operations),[56] the response to

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56. The International Court of Justice, in hearing the Nicaraguan case against the USA concerning the mining of its ports, found against the US, without dissent, on its failure to make known the existence and position of mines in Nicaraguan waters. International Court of Justice, *Case Concerning Military and Paramilitary Activities in and Against Nicaragua*, Judgement of 27 June 1987, p 102.

mining of the Red Sea and the Gulf showed that the international community can react in concert if the threat to trade appears sufficiently serious. As indicated above, it is debatable whether an attack on trade around Australia - as distinct from the routes to Australian waters - would evoke such a response, but an opponent might be expected to hedge his bets on this issue by not declaring his hand.

3.76 A strategy of covert mining provides the prospect of creating an atmosphere of crisis, which could complicate the response of government. For example, the surprise effect of the destruction of commercial shipping could produce demands for protection which might distort the preferred response by the ADF, or lead to closures of routes which were not in reality under threat. Where a conflict involved Australia's standing with third parties, the object of clandestine mining could be to embarrass Australia's defence credibility and undermine its standing with regional partners. The 'psychological effect', which has been widely noted as part of the utility of mine warfare,[57] makes these weapons particularly useful political tools.

3.77 The securing of international support (or its reduction for an opponent) has been of major significance to the outcome in many of the regional conflicts since 1950. This might constrain an opponent's tactics in mining Australian waters, but by the careful use of clandestine mining he could seek to extract a military response from us which could be portrayed as disproportionate. Whilst this might not isolate Australia, the tactic might be aimed at regionalised goals (as apparent in the Libyan attempts to reduce US influence in the Muslim world after the USAF/USN attacks on Tripoli and Benghazi). Success at the regional level might then limit the options for our Western allies to act on Australia's behalf in resolving the dispute.

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57. A Hinge, *Minewarfare in Australia's First Line of Defence*, 1986, pp 5-20.

3.78 Mining also provides one of the few means of sustaining military pressure on an opponent at ranges beyond those for the effective operation of conventional military forces. This was demonstrated by the WWII deployment of mines by Germany in Australian waters, which resulted from a conscious evaluation of the effectiveness of mining and was an enactment of pre-war planning.[58]

3.79 Mining by submarines, aircraft or commercial vessels in covert operations would allow a nation not located in Australia's area of military interest, but with some peculiar grievance against Australian policy, a range of options to achieve objectives, from creating publicity through a single incident to sustaining a campaign to alter public attitudes. To date, the world has only witnessed this type of action undertaken against aircraft by semi- and non-national terrorist groups, but there is no operational reason why the tactic could not be extended to mine warfare and undertaken by national governments as, indeed, seems already to have been the case with the Red Sea incident.

3.80 In most circumstances, however, it may be more likely that mining would represent only one phase of an action against Australia which would involve other theatres of combat. In such cases the mining would be overt and would be justified by the claim that its objective was the destruction of Australian military capability or its support. Where the general conduct of the conflict remained limited (as was the case, for instance, during Confrontation), mining could provide a means of weakening our military and economic strength which might otherwise be outside the capabilities of the enemy's conventional military power.

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58. *ibid.*, pp 3-9.

3.81 Even in those circumstances, political objectives could remain of central importance to both sides and might preclude escalatory military responses on Australia's part. In such circumstances the RAN's MCM capability would be operating not only to maintain the viability of the ADF, but also to maintain civilian morale and prevent the reduction of diplomatic and military options. Even at the height of a conventional military dispute, an opponent could well seek to invoke political pressures by the use of mining, say by mining a remote southern port in an attempt to create sufficient public outcry to divert forces from the area of operations.

3.82 This is not to imply that the Committee considers that a vast collation of mining incidents could confront Australia overnight. The number of platforms required for mine laying would be too great and, in most instances, the risk of identification too threatening to the success of the campaign to risk discovery by mounting too large an operation. Rather, the Committee notes that the range of options which modern sea mines provide an opponent is such that Australia cannot plan an MCM strategy on a single supposition - for example, that an opponent would aim to inflict maximum economic losses. An assessment of an opponent's political objectives will be a necessary part of planning MCM operations should Australia ever become involved in regional hostilities.

3.83 The flexibility of modern mines would allow an aggressor a number of options to obtain his objectives. In utilising mine warfare, an opponent could be expected to adopt the same campaign tactics which the 1987 White Paper argues could be reflected in the general conduct of low level hostilities against Australia. Those tactics include the use of dispersal and unpredictability to sustain the operational initiative, together with a strategy of controlling the options for escalatory action, including the exploitation of political factors.[59]

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59. *The Defence of Australia*, p 24.

The Australian Political Environment

3.84 The 'disproportionate response' engendered by mine warfare is not simply a consequence of the competing technologies of mines and mine countermeasures. It is also a function of the political environment, which by itself could place a disproportionate burden on Australia in responding to mine warfare. This would arise partly from the requirements of international law, and partly from the Australian political process and the nation's position in international commerce.

3.85 The essence of the problems which may face Australia in countering the use of mines is that hostile mine laying craft would be abusing the freedom of navigation of the high seas and the right of innocent passage through territorial waters, in order to create a threat. Civilian vessels ostensibly engaged in commerce to disguise their mine laying intent (which are currently assessed as the most likely platforms in a campaign against Australia[60]) would be exploiting the cover of other shipping.

3.86 Countering this abuse will necessarily involve Australian forces in actions which could require some restriction of normal navigation rights. The circumstances and methods by which those restrictions were implemented would be important to the support Australia would be able to secure from the international community. Such action has the potential for controversy unless it is directed at the shipping of a nation whose belligerent status has been declared (noting that that status has often been deliberately avoided in contemporary conflict). The fact that Australia's current air defence system

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60. Defence, *Evidence*, p 35.

is limited, particularly in surveillance and command, control and commumications, could save the ADF (for some time at least) from an even greater dilemma, namely, that of how to respond to ostensibly civil aircraft suspected of clandestine mine laying, but which ignore demands to divert for inspection.

3.87 Australia claims a three nautical mile territorial sea over which her laws (or those of the States) hold sway, with the exception that all vessels have the right of innocent passage other than for reasons which might prejudice peace, good order or security. In addition, an equal distance is designated as a contiguous zone within which Australian authorities have rights of control in regard to fishing, customs, immigration and sanitation. Except for living and mineral resource rights within a 200nm Exclusive Economic Zone (EEZ), which nations may claim under the United Nation's Convention on the Law of the Sea (UNCLOS), all other waters are the high seas where law and the international community regard the freedom of navigation as paramount.

3.88 Activities by the ADF to counter a mining campaign could not operate effectively if bound by the 3-mile limit. The approaches to many ports, particularly in the north, have stretches of mineable waters outside territorial waters. Some have constricted designated navigation channels stretching well beyond the contiguous zone. Even were this not so, the ADF would require the authority to board and investigate vessels considered suspicious far from the coast, in an attempt to control traffic before its volume increased closer to port.

3.89 Such action can be justified under the 'doctrine of necessity', that is, a justified claim that the interception of a vessel on the high seas was required in support of the

maintenance of peace. This act is required to be a 'proportioned response' in regard to the nature of the threat; and there is little doubt that, were Australia suffering a sustained mining campaign, inspection of suspicious vessels would be tolerated by the international community. The Commonwealth might be liable for compensation to an aggrieved innocent party, but any such costs would have to be assessed as inconsequential compared to the alternative.[61]

3.90 However, it is unlikely to be the questions of pure legality which would represent the nub of the problem facing Australia in a mining campaign. Greater difficulties would be likely to arise from the sheer size of the surveillance task. The extent of the maritime control problem is not limited to the 23 000, mostly foreign owned, ship movements generated annually by Australia's international trade. There is in addition considerable movement of fishing and pleasure craft around the coast.

3.91 There are no consolidated figures for the Australian fishing fleet, but recently 352 foreign fishing vessels (FFV) have been licensed to fish Australian waters, while there is an unknown number doing so illegally.[62] Again, incomplete estimates put the number of pleasure craft in Australia at 450 000, with some 40% thought capable of sea passage.[63] The potential level of activity generated from these sources can be illustrated by the returns from Coastal Surveillance reports, over a seven week period in 1987, for the northern portion of the coastline from the Pilbara to southern Queensland. During that period over 5000 sightings were made, including 409 commercial vessels, 23 foreign yachts and 495 unidentified yachts.[64] Although there is a tendency to dismiss such information in the context of mine warfare, it should be

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61. Interview with Ivan Shearer, Professor of Law, University of NSW, 17 March 1989.
62. Dovers, *op.cit.*, pp 18-19.
63. *loc.cit.*
64. *ibid.*, Appendix 2, Table 2.1.

remembered that the mining of the Nicaraguan ports was accomplished by the use of 'speed boats'.[65]

3.92 The task of controlling sea movements of this number around the strategically important areas of the Australian coast would be a major effort even without any consideration of the threat of mining. If added to a requirement to deal with other hostile actions, such as infiltration, the pressure on the ADF to control covert minelaying could be immense, and operations could sometimes exceed a 'proportioned response'.

3.93 The number of times this occurred would influence the degree of internal and international pressure to which the government would be exposed. In responding, Australia could seek unilateral agreements with shipping nations allowing boarding and search, as was agreed between the USA and several Latin American countries during the Cuban expulsions beginning in 1978.[66] Such a tactic could be used to expose the *bona fides* of the agressor nation, were it isolated as the one non-complying nation.

3.94 However, the immensity of the task and the distances involved could lead to the adoption of broader measures, such as 'exclusion zones' of the type declared by Britain around the Falklands. This would enter an area of international relations less well defined than the defensive rights of a littoral state. It is often assumed that the demonstrated ability to enforce an exclusion zone is an essential constituent of its legality but, regardless of that point, there are substantial restrictions on Australia's scope for such action.

3.95 Most basic of these are the limitations in the ADF's ability to provide adequate surveillance. Those limitations will be eased once the complete Jindalee system is in place,

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65. Hinge, *Submission*, p S275.
66. E Holsendorph, 'New Duties Burdening Coast Guard As Drug-Smuggling Season Nears', *New York Times*, 12 October 1980.

but surveillance nevertheless could still succumb to the pressures of distance and mobility. Such difficulties could support arguments for more structured solutions, one of which could be the use of protective and defensive minefields.

3.96 Whilst the use of protective minefields appears circumscribed only by the requirement to provide for the safe navigation of innocent shipping,[67] the use of defensive mining primarily aimed at restricting navigation is deemed more likely to invoke foreign concern. For instance, the closure of the Torres Strait would clearly violate the freedom of passage of international trade.[68] Such an action could alienate even the closest of Australia's allies.

3.97 Since the Strait's navigable channels are in territorial waters, it might be possible to lay an east-west minefield, in order to limit infiltration from the north, provided the safety of navigation was ensured. However, arrangements to guarantee the traditional rights of Papua New Guineans and Torres Strait Islanders involving north-south crossings and fishing within the Torres Strait Protected Zone would probably require so many personnel as to obviate the need for the minefield.

3.98 Were Australia to consider the more extensive use of mines itself and commence offensive mine laying, the maintenance of its diplomatic standing would most likely require adherence to accepted conventions of international law. Clearly, the judgment of the ICJ regarding Nicaragua will constrain the use of covert mining by Australia. However, the American success in the mining of North Vietnam, and particularly the acceptance of the argument of extended self defence as justification of its actions, demonstrates that overt mining can be both valuable and implemented with minimal political repercussion.

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67. Department of Defence, Letter, 28 February 1989.
68. *loc.cit.*

3.99 As the Department of Defence has noted, certain of the limitations imposed on offensive mining by international convention were overcome by the US in Vietnam because it provided clear warning of its intention and used time delays in its weapons to allow international shipping sufficient time to evacuate the ports.[69] The need to observe those procedures would indicate that offensive mining may become an option for the ADF only where the conflict has escalated and hostilities have become overt.

3.100 On the more immediate level, the ADF itself could become encumbered by political considerations, in this case the problems of jurisdictions divided between State and Commonwealth, or even local government authority. This problem is neither new nor unique to problems of controlling mining, and is recognised as an important aspect of conducting a campaign to defend Australian territory against restricted hostilities. Nonetheless, having quick access to the responsible authorities at state and local level once the presence of mines in a port or approaches is suspected, could be important in minimising damage and saving life.

3.101 *In conditions where government may be seeking to* preserve an ostensibly peacetime environment, ADF commanders will at times require unqualified powers to control the actions of civilians, such as, for example, enforcing restricted zones in harbours. Much of this control would be exercised through the existing civil authorities, but there may be locations where civil law enforcement is understrength and the use of ADF personnel would be necessary. This raises the difficult issue of 'aid to the civil power', a subject of sometimes lengthy debate but which, in the context of restricted operations against Australia, would still require political judgment to be exercised by the Federal government.

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69. *loc.cit.*

3.102 None of those internal political issues is insoluble, but they pose problems which could compromise the success of military operations if unrecognised. The complexity of this issue was in fact demonstrated in Exercise Kangaroo 83, the first military exercise to test the scenario of minimal hostile operations on Australian soil. The need to establish planning and executive networks was recognised as a result of that exercise, and circumstances will probably require the same forward planning should a mining campaign ever be launched against Australia.

CHAPTER FOUR

THE NATURE OF THE MINE WARFARE THREAT TO AUSTRALIA

4.1 The sea mine represents an ideal form of weapon for use against Australia in the context of the types of threat considered most likely under current defence planning. Moreover, the inherent flexibility of the mine indicates that its use is a viable adjunct to maritime operations of most types. The threat of its use, and also the opportunities it provides Australian forces, will remain a consideration whatever the level of conflict.

Patterns of Recent Use

4.2 The evidence before the Committee illustrates that sea mines have been one of the most widely used forms of weaponry in the past decade and that their use has allowed attacks on commerce where other options were not available. Even in the Persian Gulf, where other maritime forces (aircraft and light surface raiders) were used to attack commercial shipping, the mine was the only weapon used successfully against the international naval forces which had been deployed to protect the commercial vessels.

4.3 Despite the legal sanctions which prohibit the covert deployment of mines on the high seas and in ports, covert operations have in fact characterised the pattern of mine warfare over the last decade, without exception. No fields have been declared and no warnings have been issued to mariners. So far, however, there has been no concerted attempt to close an

international strait: the Iranians avoided mining the Straits of Hormuz, while the laying of mines in the Red Sea was more useful for harassment than for closing the waterway.[1]

4.4 The types of weapon used have varied, as has the nature of the fields sown. The Argentineans sowed an undeclared protective field around Port Stanley during the Falklands campaign. Little is known of the extent or nature of the mining of Nicaraguan ports, although evidence presented to the ICJ claimed that the weapons were special purpose designs and were ground mines.[2] About 20 to 25 mines seem to have been deployed in the Red Sea, the one example recovered being a modern technology ground mine of unknown Soviet type.[3] The mines deployed by Iran in the Persian Gulf were moored mines of pre-Revolutionary Russia design, but with most manufactured in Iran. One estimate before the Committee indicated that some 50 mines may have been deployed in the Iranian campaign of 1987-88,[4] but no definitive data exist. It should be noted that some thousands of mines were laid by the protagonists in the initial phases of the war, principally to block the Shat al 'Arab, and that these remain unswept.

4.5 In general, the Defence summation is that recent mine use has been characterised by the simplicity of mine technology and laying vehicles, and that fields have consisted of some 20 or less weapons.[5] The Committee would point out that the assessment of mine technology would appear relative, with those deployed in the Red Sea (or precisely, the only one recovered) having an influence-type firing mechanism. These mines were badly set for sinking vessels, being over sensitive and tending to explode before targets were within lethal radius. Similarly, the evidence is that the contact mines in the Persian Gulf were poorly laid.[6] However, regardless of the low level of

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1. Defence, *Evidence*, p 8.
2. ICJ, *op. cit.*, p 36.
3. Defence, *Submission*, p S379.
4. Hinge, *Submission*, p S277.
5. Defence, *Submission*, p S381.
6. Defence, *Evidence*, pp 6-8.

technology employed and the inexpert deployment, the response to both the Red Sea and Gulf incidents required a multinational fleet, which numbered some 20 vessels in the Gulf.

4.6 Despite the restrictions associated with the Nicaraguan, Red Sea and Gulf mine fields, a total of 42 vessels was sunk or damaged, 12 in Nicaraguan ports,[7] 16 in the Red Sea and 14 in the Gulf. Access to Nicaraguan ports was closed or restricted for two months.[8] The number of mines laid is hard to determine, especially as the responsibility for recovering or disposing of mines is avoided by a covert operation, but one estimate indicated that the hit-to-deployment ratio of the Red Sea and Gulf operations was about 1:10.[9]

4.7 Whilst the basis for such a conclusion must be considered unreliable, the ratio is not inconsistent with the results obtained in some theatres of WWII, particularly the 1:23 in the western and south western Pacific, and the 1:8 in that latter area alone.[10] It might be concluded that covert campaigns in peacetime, with the benefit of surprise, could achieve a higher measure of effectiveness than that attained during a declared war. This would certainly appear to have been the case in the Red Sea.

4.8 In any event, it is apparent that extensive damage was inflicted by mine fields which were small enough to ensure that no craft was detected laying mines in any of the three examples. The Committee was advised by Defence that small mine fields of the order of 20 weapons are the most likely to be placed around Australia in a mining campaign. Laying fields of this size was confirmed as being well within the capabilities of commercial vessels or submarines acting covertly.[11]

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7. ICJ, *loc. cit.*
8. *loc.cit.*
9. Hinge, *Submission*, p S276.
10. Hinge, *Mine Warfare in Australia's First Line of Defence*, p 6-4.
11. Defence, *Evidence*, p 35.

Implications for Australia

4.9 Based on the experience of contemporary mine use, it is clear that mine fields of sufficient size to sink or damage vessels could be deployed in Australian waters. The number of fields and the point of their deployment would vary with the objectives and tactics of the miner. As the distance from base increases so does time of transit and the risk of interception, which might be crucial to a covert campaign. Those factors might point to a greater probability of significant action in northern waters; and that the number of any mines deployed at distant locations - such as the south eastern ports - would be small. Nevertheless, the possibility of attacks on our more remote waters cannot be ignored and, as we have argued in Chapter 3, such attacks could cause serious political problems, at the least.

4.10 The extent of damage would vary with the competence and tactics of the miner. A feasible worst case situation could be the loss of two or more vessels in geographically separate fields, where a miner had executed a well planned covert lay in a number of ports. The extent of that kind of operation would be a matter of balance between risk of discovery jeopardising the operation, the degree of damage desired, and the risk that such action may compromise the miner's political strategy and justify a fuller response by the ADF.

4.11 On balance, the Committee considers that a co-ordinated covert mine strike at several ports would more likely mark the beginning of a major conventional military campaign than a 'low level contingency'. The implications for Australia of a major campaign clearly would be serious. While the immediate dangers of a low-level campaign should be less, they also could be serious. For example, a mine placed at

Barrow Island and which was lucky enough to severely damage one of the few bulk crude oil carriers on the coastal trade could complicate severely the distribution of Australia's petroleum products.

4.12 Perhaps more significant in the event of mining campaigns like those of this decade would be the length of time over which a mined port remained closed. The Nicaraguan case demonstrated the effect of mine deployment on commercial activity, as did the mining of North Vietnamese harbours. The Nicaraguan and Red Sea experiences showed that influence-detonated ground mines can be used effectively in limited conflicts, and that combating these weapons requires specialised MCM forces. The inability of a nation to counter offensive mining is both obvious and easily exploited.

The Threat to Ports

4.13 The circumstances of Australia's geography and demography indicate that, should we ever become the subject of mine warfare, the most likely focus for any operations would be around ports and their approaches.

4.14 The frequency of traffic from our major ports is such that a miner is almost guaranteed an attack by even a small field, if competently laid; and probably several if modern firing devices were used to allow minefields to activate at a time of peak ship movement, such as change of tide. The average number of daily ship movements recorded for 1986-87 was 8 for Melbourne, 6.5 for Sydney and 6 for Fremantle. Even at the bulk ports such as Dampier, where two daily movements are made on average, the frequency is sufficient to allow an attack. Further, the confinement of the approaches and the size of most of the vessels involved increases the potential value of an attack if a mine lay can be successfully accomplished.

4.15 The Committee considers that the loss of a vessel in a port or its approaches would be the way in which a mining campaign against Australia would be revealed. The preparation by an antagonist for mine warfare does not produce the same type of technologically assessable intelligence as does the development of more conventional force structures. Neither are the tactical deployments of minelaying forces as easily traceable as those of conventional forces, especially if submarines or commercial vessels are used and radio security is observed. Even if more 'traditional' espionage provided warning of an intention to mine, the threat would be difficult to preempt unless details of the mining plan were acquired.

Low Level Conflict

4.16 Identifying the likely first point of a low level attack would be difficult, as the opponent's objectives are likely to be dependent upon the circumstances driving the dispute. The Committee agrees with the Defence assessment that at the lower levels of conflict, operations are likely to be focused on the northern maritime approaches,[12] as an opponent's desire to control the level of conflict - and avoid the involvement of major ADF units - is likely to favour clandestine operations in which the security of mine laying platforms would be assisted by a short passage to operational areas.

4.17 That does not mean, however, that protection of major southern ports against mining will not be required, even at the lowest level of operations. It would be possible for the clandestine mining of a southern port to presage sustained mining in the north. It could be a strategy which would not necessarily escalate the conflict, but could make effective use of surprise and propaganda. Such an attack could have the

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12. Defence, *Submission*, p S356.

objective of embarrassing the government in a major population centre, before precautionary measures instituted in response to the onset of mining made access to the southern ports too risky. It could perhaps also offer the added bonus of striking a high value target, such as a tanker in Westernport or an RAN combatant in Sydney or Fremantle.

4.18 At this level of conflict, an opponent could expect the extent of damage to foreign owned shipping to be insufficient to cause complications within his political strategy. Ancillary benefits of such a 'terrorist-style' attack would be some disruption to shipping schedules, and the need for the ADF to deploy MCM assets in order to ensure that any further weapons were removed, and to assure commerce that it was safe to operate.

4.19 The Committee accordingly concludes that the importance of the port nodes of Newcastle/Sydney/Wollongong and Melbourne/Westernport/Geelong to both international and domestic trade will require the retention of a comprehensive range of MCM capabilities in the south east, even though the mine threat may largely focus on northern ports and approaches. Similar considerations apply at Fremantle, where the gradual redeployment of RAN fleet units to HMAS STIRLING will reinforce the need for an MCM capability. The frequency of visits by USN vessels to Cockburn Sound complicates the assessment of the mine threat to Fremantle during low level hostilities, as most regional antagonists would probably avoid prejudicing relations with the US. Although a limited covert mining operation could pose some threat to naval egress through blockage of the Success or Parmelia Channels, the open nature of the Fremantle outer harbour would make concerted minelaying a risky operation once the ADF had commenced surveillance to control it.

4.20 We agree with Defence that the objective of mining at lower levels of conflict would be to harass shipping rather than to seek the closure of ports.[13] Nonetheless, the nature of some northern ports is such that closure could result from the use of mines at the level of harassment. This is particularly the case where very large vessels are restricted to long narrow approach channels such as at Port Hedland and Weipa.

4.21 The distances between ports and other maritime facilities in the north and north west provide an aggressor numerous options for diverting and dividing ADF MCM assets, even when the operational objective is merely harassment. In those circumstances, it may have to be accepted that one or more ports will have to remain closed, as a cost of war. As data presented above indicate, the cost of such closures could impact on individual corporations and could jeopardise their commercial survival. In cases where the port's activity was the only significant source of employment there could also be consequences for local prosperity. The cost to the national economy would not, however, be insupportable.

4.22 The Committee considers that during a restricted mining campaign aimed at the harassment of shipping, priority should be given to protecting those ports where an aggressor could cause severe problems with minimum effort. Our MCM forces should seek to make best use of the characteristics of the ports concerned. There should also be restrictions placed on non-commercial visits; increased surveillance of approach channels; and interception and investigation of any vessel approaching without authorisation. Risk might also be reduced by the application of passive MCM measures to vessels habitually using the ports.

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13. *ibid.*, pp S365-6.

4.23 Depending upon the assessed motivation of the miner, and his apparent intent to avoid contact with ADF regular forces, or otherwise, greater or less attention would have to be given to safeguarding the logistics network of the ADF. This would be especially important with the supply of petroleum products, transport of which in adequate quantities may only be possible by sea. For example, the environment of King Sound has provided cover for illegal fishing boats, and could be similarly used for assisting clandestine mining of the approaches to Derby, aimed at interdicting fuel supplies for RAAF Curtin. Similar action could be aimed at the proposed RAAF airfield near Weipa (the attractiveness of which would be increased should the international space facility be built). Although Darwin's approaches are more open than in these two examples, its security would remain important for the logistic build-up necessary for the deployment of naval and land forces should a dispute worsen.

Escalated Conflict

4.24 The Committee agrees with Defence that, were a conflict to escalate, an opponent may attempt to disrupt shipping using northern ports.[14] We particularly note Defence's summation that:

> In the context of MCM, differences between low level and escalated low level conflict would relate mainly to the nature and location of areas mined and possibly the number of mines laid in each area, and the possible threat to MCM vessels from other forms of attack. The difference is more one of the nature and possible scale of operations than of the type of mine. From the mine layer's viewpoint, the main difference is one of creating a significant threat to shipping rather than a nuisance or harassment level of threat.[15]

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14. Defence, *Submission*, p S364.
15. *ibid.*, p S347.

4.25 It is our opinion, however, that in such circumstances the ADF may not be able to respond to an increase in mining activity. As a dispute worsened, the attention of MCM forces would probably have to focus more sharply on protecting logistic networks, as mentioned above. Indeed, an attack on shipping may not necessarily be the principal objective of a miner. When a dispute had deteriorated to the stage where both sides were openly employing their armed forces, the advantages of anonymity would no longer figure in the political strategy of the miner, and he would be able to employ his assets more freely. The risk of losses amongst minelaying platforms would be offset by the advantages of increasing and dispersing the ADF's MCM commitments.

4.26 The opponent's options to mine southern ports might be constrained in those circumstances by the risk of interdiction by ADF patrols, although where conditions were suitable submarines could be used to extend the diversion of MCM units. The use of air-laid mines could greatly increase the range of tasks with which the ADF's MCM forces would have to deal and, depending on the basing of the adversary, could be used against ports from the Pilbara to the northern Barrier Reef. Both areas present valuable targets, especially once the export of LNG from the north west shelf has commenced.

4.27 The Committee notes, however, that an increased level of threat to shipping may be of less concern to the conduct of a campaign than military priorities. Once a conflict came to involve conventional force elements of either side, Australia's priority clearly would lie in keeping open those ports which directly support the logistic requirements of the ADF. Given that a dispute may have escalated from the stage of guarded harassment to hostilities between conventional military units quite quickly (an eventuality which could be precipitated by Australia to upset the adversary's political strategy and

remove restrictions on the ADF's intervention against an under-prepared opponent), Australia could enter this stage of a conflict with no more MCM forces than she possessed at the beginning. Indeed there may be less, if losses of vessels had been sustained during mine clearance.

4.28 At this juncture it would probably be to Australia's advantage to deploy mines offensively against the known bases of mine laying platforms, using both submarine and air delivered weapons. Aggressive patrolling would also be used against mining platforms. However, as long as a political settlement remained possible, restraints on the conduct of both sides would be likely to persist. The rules of engagement may well proscribe attacks on airfields, but, regardless, it would be unlikely that offensive operations by the ADF would sufficiently curtail the mine threat to reduce its importance.

4.29 MCM forces, therefore, would be required to safeguard access to areas with a major military role. Principal amongst these will be Darwin, RAAF Weipa (once constructed), RAAF Curtin and Townsville. There will probably be a need to deploy elements to ports which would be supporting deployed elements of the ADF engaged in surveillance and patrolling. These will probably include Cairns, Broome and possibly Port Hedland.[16]

4.30 The Committee concludes that such operations will probably fully engage the regular MCM assets of the RAN . The protection of commercial shipping will then depend on the expansion capacity available to the RAN through Reserve operated mine sweepers. This will represent an inherently less flexible approach to port clearance than the combination of hunting with sweeping, and risks losses of shipping should an opponent have access to firing mechanisms which are difficult

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16. The Defence submission mentions a total of 9 ports which would be important in supporting a deployment of the ADF. *Submission*, pp S354-55.

to sweep. In such a situation the port may have to be closed until a mine hunter can be diverted to assist, although in some circumstances a CDT may be able to clear a port, where the location of mines is known.

4.31 The knowledge that a potential opponent possessed a mining capability sufficient to absorb Australia's MCM force in the protection of military assets could constitute a strong disincentive to an escalatory response by us to a low-level campaign. In such circumstances attacks on commercial shipping could be ultimately aimed at reducing the operational flexibility of the ADF, and thereby preserving any advantage to the adversary by his setting the level of hostilities.

Threats to Security of Passage

4.32 The Committee agrees with the conclusion drawn by Defence that most of Australia's sea routes

> offer little prospect for minefields to be fully effective because shipping is not usually sufficiently constrained to allow the laying of minefields which give a high probability of either damaging or sinking shipping, without involving the adversary in a disproportionately high rate of mine laying effort.[17]

4.33 However, exceptions exist in areas of restricted navigation, specifically Bass Strait, Torres Strait and the Great Barrier Reef. All lie within shallow areas suitable for the use of ground mines.

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17. Defence, *Submission*, pp S348-49.

4.34 The width of Bass Strait makes it difficult to mine. Consistent with the WWII experience, the most likely plan for mining would be placing a small field near the recommended navigation route.[18] While we agree that re-routing of shipping would be the appropriate countermeasure, it should be remembered that this can only be done once the size and disposition of the field has been assessed. Where the RAN lacks the operational capability adequately to survey any field, occasional mining of the Strait would offer an effective disruptive tactic to an opponent. Preventing that tactic could be difficult at lower levels of conflict given the Strait's status as an international waterway.

4.35 Torres Strait, with its few restricted navigation channels, is a high risk area for Australia. Closing its channels may, however, be seen as too extreme by any aggressor who wished to retain international support. Nevertheless, as its closure would severely restrict the deployment of ADF units based on the east coast, mining the Strait could well become attractive should the conflict escalate. The unusual bottom characteristics of the Strait may hamper the timing of any mining operation, but would also greatly complicate the MCM effort. The uncertainty of clearance created by the periodic burial cycle of the Strait's sand waves probably make it an ideal location for the declaration of a dummy mine field, once a mining campaign had become overt.

4.36 The sheer extent of the Barrier Reef and its various restrictions on navigation present many opportunities to a potential miner. Defence notes that it can be mined to seaward by submarines, and along its 1000 miles of navigation routes by surface craft.[19] The number of surface craft in the Reef, and in its northern approaches, is high. Sightings made by Coastwatch

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18. *ibid.*, pp S370-71.
19. *ibid.*, p S372.

flights for the limited period of 1987, mentioned in Chapter 3, indicate an average of vessels sighted per flight as high as 42 per sector of the GBR area. Taking the Reef and the Torres Strait island approaches to the north, the 4000 sightings in the area constituted almost 80% of the total reports gathered by that organisation for the seven week period.[20]

4.37 Aerial mine laying is also feasible at all levels of conflict. The remoteness of many parts of the Reef and its proximity to island airstrips would assist covert minelaying just as much as they are alleged to facilitate drug running. Even the extension of the Jindalee system to cover the north east may not solve this difficulty, as the Weipa airfield is to be a bare base and may not be garrisoned in the initial stages of a dispute. Indeed, remote radar coverage of the Reef may provide additional options in a mining campaign, deliberately allowing simulation of aerial laying to be detected in order to over-extend the ADF's MCM capabilities.

4.38 Formal defence planning does not yet appear to have responded to the Minister's concerns about security of passage for shipping through the archipelagos to Australia's north (as discussed in Chapter 3). The Committee noted that the threat of mine warfare in that area should be considered as a component of any analysis of the general threat to shipping. It concluded that mineable waters were to be found in the west of the region and, to a much more limited extent, in some shipping channels to the extreme east. Two ASEAN countries in the region have taken precautions against the mine threat by purchasing modern MCMV. Malaysia has four Italian *Lerici* class minehunter/sweepers, whilst Indonesia operates two Dutch built *Tripartite* MHC. Further to the north west, Thailand has two German *Lurssen* minehunter/sweepers. All are newly acquired.[21]

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20. Dovers, *op.cit.*, Appendix 2.
21. Defence, *Submission*, p S339.

4.39 The nations of Melanesia, on the other hand, have no MCM capability. For defence against mining of their waters, the island States would be dependent on external assistance. In general, they have an expectation that such types of military aid will come from Australia, but in the case of MCM we would be as unable to provide this assistance as we would be to safeguard the passage of Australian trade.

4.40 In these circumstances, there is a conjunction between an Australian strategic interest and regional co-operation. This is even the case in the west of the region, where the most attractive target for mining is the Malacca Strait which, although beyond Australia's area of direct military interest, is well within the region of strategic interest.[22] A feature of recent mine use in international waterways has been the willingness of maritime nations to contribute to a joint effort of clearance, and it is likely that any need to clear the Strait would draw such a response, given the variety of flags which ply it. As there is a broadly comparable involvement of trading nations making use of the other passages of the archipelago, a similar multinational perception of the mining threat would appear likely.

4.41 Such a multinational response may offer an opportunity for further developing regional defence co-operation as well as an appropriate response to the threat to Australian trade in this area. In its submission to the Committee, the RSL commented that Australian consideration of security of passage in mineable waters in the region should not focus on the ADF in isolation. It referred to studies of the formation of a regional MCM consortium, but recognised that it was unlikely that such a body could be established easily, and suggested that Australia initiate bilateral MCM arrangements within the region.[23]

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22. *The Defence of Australia*, p 2.
23. RSL, *Submission*, pp S158-159.

4.42 Sufficient scope to pursue such a suggestion should already exist under the auspices of the Five Power Defence Arrangements and perhaps, although not as certainly, as an extension of what the Minister has referred to as 'naval passage exercises with Indonesia'.[24] The Committee considers that such an attempt to co-ordinate and extend the regional MCM capability would represent an appropriate response to the scale and extent of the mine threat to security of passage through the archipelago.

Conclusion

4.43 The characteristics of mine warfare and the extent of Australia's coastline present such a variety of options for the conduct of a mining campaign that the identification of priority threats simply could be misleading. An enterprising opponent would be able to assess the Australian analysis of its weaknesses, and do something else. Nor need he conduct his campaign in the logical sequences of a conventional military campaign. The flexibility of the mine as a weapon, and the demonstrated contemporary willingness to use it without warning, enable the miner to commence his campaign far from his principal operating area.

4.44 Recent experience indicates that the warning time which would be given of an opponent's intention to use mines is very short. When allied to the technical difficulties of detecting and classifying objects on the sea bottom, it is not surprising that the first warning of mine use almost invariably is the detonation of one of the weapons by a passing vessel. This is not to say that a mining campaign will come without warning. There will, of course, be manifest causes of dispute and a growing atmosphere of hostility presaging the resort to

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24. The Hon. Kim Beazley, *Australian Defence Policy*, 9 December 1988, p 8.

violence. However, while the use of other military capabilities is often deterred by the possession of superior forces, this has not been the case with contemporary mine warfare. On the contrary, its characteristics are such as to have endeared it to groups with comparatively little conventional military capacity.

4.45 The Committee does not necessarily consider that the most likely use of mines against Australia would arise in circumstance of very limited conflict. The flexibility of the weapon, and the availability of platforms which can position it in a number of environments, make it effective at all levels of conflict. Were Australia to be involved in a conflict of more conventional military nature, mines could be expected to be amongst the first weapons deployed as both combatants sought to restrict the deployment of each other's naval forces.

4.46 The prospect of Australian involvement in a conventional conflict at present is extremely low, and any probability that such a conflict would threaten our security would require a considerable build up of forces in the region. Any development could be monitored by technological means, although it should not be forgotten that the development of mining capabilities is not easily detectable and would almost certainly be a part of such a build up. From that it follows that an equivalent buildup of Australian MCM forces would be essential during a period of general military expansion.

4.47 Given that in the foreseeable future any opponent using mines against Australia is likely to be doing so as a method of circumventing a comparative military weakness, one could expect his objective to be aimed primarily at securing political concessions rather than achieving military victory. This indicates to the Committee that such a campaign would follow a dispersed rather than a unified strategy, both to

extend the ADF's MCM resources and to safeguard the aggressor's operations. We consider that under those conditions it would be unrealistic to expect the ADF to provide balanced MCM capabilities at all areas under threat.

4.48 To draw an analogy with counter-terrorist planning, it must be expected that at some time the miner will be successful and in the light of contemporary mine warfare experience it must be acknowledged that this success might be won sooner rather than later. The Committee has identified areas of particular vulnerability, especially where environmental features offer a miner a disproportionate chance of success. These areas will change with the nature of hostilities, of which the mining campaign will be a part. We have also noted options for a miner to extend and dilute the efforts the ADF may mount. In particular, the Committee notes the vulnerability arising from the specialisations in some areas of maritime trade, especially in the distribution of petroleum products; and the potential over-extension of MCM forces in protecting the ADF logistic network should a mining campaign at the level of harassment quickly escalate to more open hostilities.

4.49 Our assessment, however, is that even the most damaging losses to trade could be borne by the economy, though possibly at some discomfort. This assessment carries the proviso that sufficient MCM resources are retained in the south east to reassure international trade that any mining of those ports will not exceed the level of terrorist-style harassment.

4.50 In summary, the Committee agrees with Defence that Australian MCM forces must have good mobility in order to deploy in response to the emergence of threat,[25] and incorporate characteristics which give sufficient flexibility to allow operations in the variety of conditions and against the range of threats which can be expected.[26] As with the other areas of ADF equipment, meeting those criteria derived with

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25. Defence, *Submission,* p S351.
26. *ibid.,* p S356.

regard to Australia's requirements will provide performance suitable for cooperation with regional forces. In general terms, we assess that the nature of the mine threat Australia could face requires characteristics in the MCM force little different from those asserted in the White Paper as being relevant to the ADF in general: 'range, endurance, and mobility, and independent logistic support'.[27]

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27. *The Defence of Australia,* p 31.

CHAPTER FIVE

THE RAN RESPONSE

5.1 Chapter 1 of this report traced the decline of the RAN's mine countermeasure capability, and the protracted gestation of so far unproductive attempts to rectify this situation. Commenting on the matter, Dibb noted that 'the most important deficiency in the naval force structure is the absence of an operational mine countermeasures capability'.[1] He went on to point out that the development of MCM forces had been under consideration for more than 15 years as the 'result of poor planning and procrastination'.[2]

Strategic Analysis and its Implementation

5.2 The unsatisfactory rate of progress in the MCM project has been in part due to conflicts of priority between it and other RAN capital acquisition programs. The Auditor General, in reviewing the Minehunter Inshore (MHI) project in the early 1980s, found that tardy selection of government furnished equipment (GFE) had either delayed or degraded the efficiency of the design process. The selection of the minehunting system had taken so long that the validity of the tenders had lapsed, leading to some doubt over whether one of the contenders had re-submitted a new tender using information gained from the evaluation process, rather than simply revalidating his existing offer.

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1. Dibb, *op.cit.* p 125.
2. *loc.cit.*

5.3 One of the causes of those delays was the absence of a response from management to the project team's calls for appropriate staffing for what was designated a priority task, but which management felt unable to provide because it had other priorities.[3] These shortages of skilled personnel compounded Navy's underestimation of the complexity of the project (mentioned in Chapter 1), which has seen both time and financial estimates greatly exceeded. At about the same time, consideration was given to purchasing two *Hunt* class vessels to provide an immediate MCM capability. However, the Government's approval in principle for that purchase was withdrawn because of the higher priority accorded to other programs, amongst them ASW helicopters.[4]

5.4 The Dibb Report noted that the RAN's MCM plans were developed around a minehunting fleet eventually comprising six MHIs, a minesweeping contingent of 10 COOP and the use of suitable commercial helicopters (helicopters of opportunity, hence HOOP) as precursor sweepers. The COOP proposal was based on the lease of four large and four small commercial vessels for towing sweeping gear, with two also fitted for limited route survey.

5.5 This force was to be disposed on both east and west coasts, with four MHI and five COOP in the east and two hunters and the remaining COOP in the west. The MHI component would have allowed only two vessels to be maintained on task continuously in the east, and one on the west coast. As a whole, it was assessed that the MCM force was capable of keeping cleared only two priority ports simultaneously.[5]

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3. The Auditor General, *Report of the Auditor General*, 'The Minehunter Catamaran', May 1983, pp 13-14.
4. Dibb, *op.cit.*, p 125.
5. *ibid.*, pp 125-126.

5.6 Furthermore, there were a number of uncertainties concerning most aspects of the RAN's proposals. The MHI were restricted to a proving program using two prototypes, with the remainder of the fleet not to be ordered until trials had been completed successfully. Even then, the MHIs were designed specifically for operations in sheltered waters and were restricted in rougher weather. The COOP program was dependent on the availability of suitable commercial vessels, while Dibb also observed that the program's development might be jeopardised by the continued absorption of skilled personnel by the MHI project until the early 1990s .

5.7 Dibb recommended that if the mine sweeping technology proved successful, at least four vessels should be purchased by the Navy, for operation on both coasts, in addition to leased COOP. This was to provide a cadre of Permanent Navy personnel as a training base for the Reservists who were intended to operate the COOP. Notwithstanding the use of the Reservists, Dibb estimated that an additional 180 Permanent Navy personnel would be required for the force by 1990. His Review warned that if ultimately the proposals proved impractical, an urgent purchase from overseas of a minimum of three sweepers would be required, at a cost of some $300m.[6]

5.8 The 1987 White Paper translated the Dibb Report's strategic analyses into policy. It accepted both the importance of the mine threat in Australia's strategic situation and the force structure proposals developed in response. The provision of a mine countermeasure capability was given a high priority. The progress with the MHI program was noted and it was stated that the two prototypes would be followed by the acquisition of at least four more, subject to their success in trials, 'and

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6. *ibid.*, p 127.

TABLE 5.1: DEFENCE'S FORCE STRUCTURE PLANNING

	Shorter Term Contingencies			More Substantial Conflict		
	Number	Cost $m	Manpower(1)	Number	Cost $m	Manpower(1)
Minehunters						
MHI	6	465	84	12	981	168
Minesweepers						
COOP	10	47	88	20	94	176

Note: (1) Manpower figure is based on ships' complements and assumes single crewing for the COOPs.

Source: Department of Defence, *Submission,* p S393.

further review of our priority needs'.[7] Additionally, the Paper approved the COOP concept and its use of Reserves; the need for a precursor sweep (protection against mines targeted on MCMV); and the development of a mine warfare centre. The force structure presented by Defence to this Committee is detailed in Table 5.1.

5.9 The Committee was impressed, both during hearings and in the field, by the effort exerted by RAN officers and sailors to implement this program. The Director General, Naval Warfare has expressed satisfaction with financial allocations made to the MCM program to date.[8] To the end of 1987-88, $82.6m had been spent on the MHI and $3.5m on the minesweeping project.[9] Trials with commercial vessels, which had begun in 1986, were continued into 1988 and involved the evaluation of eight different craft. As a result, the Navy has now taken up three COOP vessels, based at HMAS WATERHEN for further development of the concept.

5.10 Progress has been made with support and training elements of the program. Plans for the Mine Warfare Systems Centre at WATERHEN are proceeding on schedule and construction is due to commence in 1990. Moreover, its cost, at $40m,[10] is somewhat less than earlier estimated.[11] A transportable degaussing range is being developed, a training mine field has been established off Jervis Bay, and high performance Stonefish training mines have been purchased, with an option for future additional procurement. A shallow water sound range was completed in 1987 and, after adjustments, was scheduled to become operational this year.

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7. *The Defence of Australia*, p 45.
8. Defence, *Evidence*, p 47.
9. Department of Defence, *Explanatory Notes 1988-89*, August 1988, p A3-2.
10. Defence, *Submission*, p S398.
11. Dibb, *op.cit.*, p 126.

5.11 There are, however, some aspects of the MCM program about which the Committee is concerned, and which we consider may warrant careful reconsideration of current programs and some reassessment of basic concepts. Most of these concerns relate to long-term matters and do not need immediate action. Two issues, however, do require urgent attention. These are the imminent loss of what little minehunting capability the RAN currently has, and the wastage rate among MCM specialists. Both of these problems arise from the delays in the MHI program.

The Minehunter Inshore Project

5.12 The RAN's *Bay* class minehunter is of Australian conception, design and construction. The ships are catamarans built entirely of glass fibre/foam sandwich and, at 30m long and displacing 170 tonnes are the largest craft of this type of construction ever built in Australia. Their construction required the establishment of capabilities new to Australia at the builders, Ramsay Fibreglass, a subsidiary of Carrington Slipways. Plans are for the MHIs to be equipped with an MWS 80 integrated minehunting system built by Krupp Atlas Elektronik (KAE) of West Germany, and a PAP 104 mine disposal vehicle built by ECA, a French company. To date, two prototype vessels have been built, HMA Ships RUSHCUTTER and SHOALWATER.

5.13 The prototype status of the MHI project is the most influential factor affecting Australia's current mine countermeasure capability. Because the project applied hull forms and construction techniques in a combination not previously used for MCM, and required construction to military specification in foam sandwich on a scale not previously

attempted by Australian industry, both vessels were ordered as prototypes. Orders for any subsequent vessels were to be delayed until trials had confirmed the capability of the design, or otherwise.

5.14 Stage 1 of the project dealt with concept validation and was approved in 1975. Stage 2, which included the procurement of three sets of equipment and the construction of the two prototypes, was approved the following year. For a number of reasons (some of which were detailed above, and included the need to construct a specialised manufacturing facility and a subsequent contractual dispute about its ownership[12]), progress with construction of the hulls was unusually slow. It was not until 1 November 1980 that tenders were called,[13] and not until 28 January 1983 that the contracts for the construction of two hulls were finally awarded to Ramsay Fibreglass.[14]

5.15 Whereas the 1976 Defence White Paper had foreseen *operational* MCM craft entering service 'during the first half of the 1980s',[15] by the time tenders were called, delivery of the first *prototype* was not expected until late 1984. When the contracts were eventually let, delivery of the first was to be in late 1985. During the course of construction delivery slipped even further, with RUSHCUTTER being launched in May 1986 and commissioned in the following November. SHOALWATER followed about a year later.

5.16 In contrast, action to procure the mine warfare systems was reasonably prompt. In January 1979 contracts were awarded to three companies to provide contract definition studies for the minehunting weapon system. In July 1981 it was

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12. Defence, *Evidence*, p 13.
13. *Defence Press Release*, No. 208/80, 31 October 1980.
14. *Defence News Release*, No. 13/83, 1983.
15. *Australian Defence*, AGPS, Canberra, November 1976, p 21

announced that a $12m fixed price contract had been awarded to KAE for the supply of three MWS 80 integrated minehunting systems.[16] By the time the $23m contract for the construction of the prototypes and their fabrication facility was let, some $30m had already been spent on equipment for the MHIs.[17] Shortly after the ship building contract was awarded, agreement was reached with Societe ECA for the supply of three shipsets of ECA38 PAP104 mine disposal submersibles for $3.6m.[18]

5.17 Shock testing of the prototype (to prove construction) was completed satisfactorily, with SHOALWATER passing trials off Townsville in November 1987. However, the craft proved incapable of meeting the specification for operating in sea state 3. The MHI was designed specifically for operations in the sheltered waters of ports and their close-in approaches, but the craft's inability to operate in conditions of wave heights approaching 1.5m and wind gusts of less than 20 kts indicated that its performance would not meet the inshore criteria identified for the RAN's concept of operations.

5.18 To overcome this problem several modifications have been applied, the most important of which has been the addition of bilge keels, and which have improved seakeeping sufficiently to meet the specification.[19] Navy is now satisfied that the hull will be suitable for its inshore MCM operations. However, it still is not prepared to accept that the vessel will completely meet its requirement.[20] The continuing uncertainty now arises from the fact that the MCM program does not have an operational sonar system.[21]

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16. *Defence Press Release*, No. 151/81, 22 July 1981.
17. *Defence News Release*, No. 13/83.
18. *Defence News Release*, No. 78/83, 18 May 1983.
19. Defence, *Evidence*, p 16.
20. *ibid.*, p 17.
21. *ibid.*, p 39.

5.19 It is perhaps ironic, but it is the performance of that part of the system which originally was considered as a lesser risk than the untried Australian construction concept, which is now preventing final confirmation of the MHI's acceptability. The problem lies with the DSQS-11H sonar, which forms the detection element of the MWS 80 system. Following the modification of the catamarans with the bilge keels, it is necessary to confirm that any quelching caused by those keels does not restrict sonar operations, and that the MHI does in fact have sufficient sea keeping performance to maintain sonar stability. The DSQS-11H has proven incapable of satisfying those fundamental tests. The Australian experience with the DSQS-11H seems similar to that of the FRG Navy, which is experiencing problems in its trials of the sonar for its 332 series of MHC,[22] and has already opted for a French system in its SM 343 class MCMV (for which the DSQS-11H was originally conceived).[23]

5.20 The problems with the DSQS-11H appear to have been insurmountable. Despite the efforts of KAE technicians and a reported assessment that the sonar would be performing sufficiently well for acceptance trials in November and December 1988,[24] the equipment's performance remained unacceptable at the time of writing. Negotiations are proceeding with KAE, but it appears that only the development of a new system will resolve the problem. That process could take anything up to four years.

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22. German MCMV Forces, *Military Technology*, July 1988, p 31.
23. The KAE MWS 80 - Minehunting Weapons System, *The Navy*, April 1986, p 17.
24. *Defence Industry*, 12 Oct. 1988, p 2.

5.21 In late 1988 an RAN team went overseas to assess alternative systems[25] and KAE itself is now offering a new sonar, the DSQS-11M (which despite its similar designation uses a more conventional technology than the earlier system) for the MHI.[26]

5.22 Whatever solution is adopted, a further delay in the MHI program is now inevitable. To compound the problem, the RAN will soon lose all its minehunting capacity. Its only operational MCMV, HMAS CURLEW, is due to be paid off in April 1990.[27] It is not possible to have an operational sonar aboard an MHI by then. Further, CURLEW's 193M sonar has been used to validate the trials of the MHI sonar, so that facility also will be lost unless an expensive 6 month refit is carried out on the old MCMV. The RAN had hoped to lease another of the *Ton* class from Britain to replace CURLEW, but has not received a favourable response.[28]

5.23 The imminent complete loss of minehunting capability in the RAN has serious implications which go beyond operational considerations. The development of the MWSC will be delayed by the limited collection of sonar data to revise and maintain information on the characteristics of shipping channels. Naval personnel will be left without any means of developing their skills, with implications for the future staffing of this area. Finally, without an operational system to demonstrate, the export potential of the MHI project has been placed in considerable jeopardy.

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25. Defence, *Evidence*, p 15.
26. Defence, *Submission*, p S421.
27. *ibid.*, p S425.
28. *loc.cit.*

The COOP Minesweeping Project

5.24 Technical advances made by DSTO have underpinned the steady development of the craft of opportunity minesweeper concept. Conventional minesweeping gear needs significant electrical generating capacity to produce the magnetic and noise influence fields necessary to actuate ground mines. Those fields are generated by working coils and mechanical noise generators via electrical cables from the ship, which in turn means that a reasonably large and powerful vessel is necessary. As a result, conventional minesweepers tend to be complex and expensive and can cost from $100m[29] to $130m per unit.[30]

5.25 DSTO's innovations circumvent the need for platform size and power. The key to their magnetic influence sweeps is the use of permanent magnets made from strontium ferrite (the same material which seals refrigerator doors). The strontium ferrite is incorporated in a series of floating log-like units, called mini dyads. A complementary computerised analysis system determines how to assemble a combination of dyads to simulate the magnetic signature of any type of vessel. The end result is a sweep which does not require an external power supply. A similar approach is reflected in the DSTO noise influence sweep, in which sound is produced by a water driven pipe noise maker; again, there is no need for onboard electrical power. Finally, the Australian Maritime College has applied deep water trawling techniques to develop a mechanical sweep for tethered mines.

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29. *Defence, Submission,* p S385.
30. Commodore A R Cummins, *Australian Minewarfare Developments,* Address to the USI of the ACT, 3 Dec 1987, p 14.

5.26 The COOP sweeping system is supported by a demagnetising process (known as 'degaussing') which is based on the use of thousands of magnets also made from strontium ferrite and which makes a vessel 'disappear' magnetically.[31] That degaussing system reportedly is small and sufficiently adaptable to be effective on a wide range of vessels. DSTO has also given considerable attention to developing an adaptable silencing system for the COOPs,[32] to reduce engine and other on-board machinery noise.

5.27 As a consequence of those programs, the RAN will be able to conduct mechanical and magnetic and noise influence sweeping using most vessels of between 15 to 35 metres which are equipped with a bollard tow.[33]

5.28 An associated part of the COOP program is their role as auxiliary survey vessels. Two of the craft will be fitted with a sea bed survey system and will be designated COOP(I) (for investigative). The survey system consists of a commercial side-scan sonar mounted in a 'tow fish' (a hydrodynamically stabilised container) which is trailed behind the COOP. Sonar displays are linked to precise navigation equipment and data systems, thus allowing contacts to be developed into a data base.

5.29 The system is designed for operation by Reservists with limited training, and will allow preliminary surveys of the channels used for navigation in ports (known as route survey). However, due to technical limitations, mostly

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31. 'Wipe Mines, Hide Ships, Wreck Credit Cards Too', *DSTO Research News,* No. 10 1988, p 8.
32. *loc.cit.*
33. *ibid,* p 15.

associated with the oscillations of the tow fish, the surveys are only of sufficient quality to allow a minehunter to begin operations. As such they do not provide accuracy and classification of the quality required for a Mine Warfare Pilot Survey, for which the high definition sonar fitted to MHIs is needed.[34]

5.30 Phase 1 of the COOP project began in 1985 and was aimed at validating technology and concepts. It involved trialing the various sweeps and the surveillance package for the COOP(I), and gaining experience on the various types of craft available. The degaussing concept was proved in trials in September 1986. Tenders were called from industry for Phase 1 from 1986 through 1988, and in 1988 and 1989 tenders were called for the provision of three shipsets of each type of sweep equipment, plus a further three for expansion and spares support[35] under Phase 2 of the project. As well as acquisition, this phase marks the beginning of vessel hire and operation under lease, a data base of suitable vessels around Australia having been gathered during Phase 1. Currently two leased fishing vessels are based at WATERHEN.

5.31 In the meantime, a former Department of Transport support vessel was purchased in January 1988 and commissioned as HMAS BROLGA to conduct trials of COOP equipment. The concept of leasing vessels is however being reassessed. Stage 1 investigations showed that license holding requirements for Australian fisheries limit the number of vessels which can be leased for short periods. Consequently, the balance of leased and Navy owned vessels in the COOP force is being re-evaluated,

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34. Defence, *Submission*, p S333.
35. *ibid.*, p S429.

and it is currently planned that Phase 2B, developing the large COOP phase of the project, will start this year using two Navy tugboats. The use of Navy vessels for the large COOP would be consistent with the recommendations of the Dibb Report.

5.32 In our opinion, the development and implementation of the COOP project is proceeding well and is on schedule.[36] Operational capability is scheduled for 1990-91 and it is proposed to trial the three developmental COOP during Exercise K89 later this year. Even the project cost, at $106m, has been restrained to the level estimated when the Dibb Report was collated.

Precursor Sweeping

5.33 Precursor sweeping is another area in which the original concept of operations has had to be revised. The Committee has not been convinced that Defence has as yet entirely solved this problem. Precursor sweeping is necessary for the safety of the MCMV and its personnel, and is used to detonate mines which are finely set, specifically to attack MCMVs. The particular requirement for the RAN is for noise precursor sweeping, as the magnetic signatures of the MHI and COOP are well controlled.

5.34 The original concept was to tow a noise generator through the minefield by helicopter. It was intended to design a sweep which could be deployed behind any available commercial

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36. Defence, *Evidence*, p 23.

medium helicopter, rather than the large and specialised helicopters used overseas for minesweeping. A contract was awarded to Hawker de Havilland in July 1987 to develop and trial a helicopter sweep. These trials were subsequently completed successfully using an RAN Sea King.[37]

5.35 Unfortunately, investigation of the civil helicopter assets in Australia indicated that the concept was not likely to provide the basis of a capability. Only between five and eight helicopters of the necessary size were in-country, and most of those were not on the Australian register and so could not be co-opted during hostilities. Furthermore, the exigencies of civil Certificates of Airworthiness make it difficult and, at best, expensive for a helicopter modified for sweeping to remain on the civil register. There were also technical difficulties in using helicopters to sweep some mines with particular logic circuits.[38]

5.36 Consequently, the RAN has discarded the HOOP concept and now proposes to use drone boats in the precursor sweeping role. These are remotely controlled boats which are used to tow a noise sweep and are reportedly more survivable than their role would suggest. At the time of its investigation, Defence was not sufficiently advanced to provide details of the proposal to the Committee or of the concept of operations. However, the Committee understands that an indicative cost for each system of boat, controls and support might be about $1.5m.

5.37 Whilst accepting that the drone boat is an appropriate technical solution to the precursor sweep requirement, the Committee believes it may be inconsistent with the overall

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37. Defence, *Evidence*, p 40.
38. *ibid.*, p 41.

concept of operations for Australian MCM. The value of the original HOOP concept was in the high degree of mobility of helicopters, and the expectation that helicopters involved in commercial activities would already be at some ports under threat and so would not require RAN logistic support. While the concept did not prove viable using commercial aircraft, its inherent advantages could still be exploited by military helicopters.

5.38 Neither the MHI nor COOP would be capable of transporting a drone boat to a forward operational area (unlike the Swedish *Landsort* class MCMV which carries its own remotely controlled vehicles for precursor sweeping). Presumably, a drone boat would be transported with the other elements of forward support for MCM operations. We have reservations on this matter, which we raise in detail below. In the meantime, we believe the question of helicopter precursor sweeping should be left open.

Personnel

5.39 In 1988 this Committee completed an extensive inquiry into personnel wastage in the ADF.[39] That report concluded that 'people are the Force's most valuable asset and vital resource', and that currently 'personnel wastage is the most pressing matter facing the Defence Force'. Setting priorities for the development of an effective MCM force will therefore be a largely futile exercise if satisfactory arrangements are not in place for the recruitment, training and retention of sufficient numbers of suitable people.

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39. *Personnel Wastage in the Australian Defence Force - Report and Recommendations*, Canberra, 1988.

RAN Manpower

5.40 Navy has developed a comprehensive manpower plan for the total MCM program. It addresses such issues as the branch structure, ship/shore ratios and career development.[40] The first phase of the plan has been activated to satisfy initial manning requirements for the MHI and COOP components of the total MCM plan. Further, the RAN has afforded a 'high priority' to regaining an MCM capability, with the hunting and sweeping projects listed ninth and 20th respectively in an overall priority listing of some 200 projects.[41]

5.41 A particularly interesting aspect of the MCM project is the decision to crew the COOPs primarily with Reservists. The Committee supports that innovative approach. It will make use of the local area knowledge of the Reservists, give them a clearly-identifiable role, and minimise demands on PNF manpower. At the same time, PNF staff must be involved in the COOP activities both to ensure standards and coordinate sweeping capabilities within the total MCM force. As we pointed out earlier, Dibb identified a need for an additional 180 PNF personnel for the MCM force by 1990. Defence's estimated manpower requirements are shown at Table 5.2.

5.42 Despite the relatively high priority listings accorded to the MCM force, the Committee remains concerned about Navy's ability to staff the MCM program satisfactorily and, consequently, to develop the capability speedily. In its submission to our inquiry into personnel wastage, the RAN identified a manpower shortage of 1200 over the FYDP period and

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40. Defence, *Submission*, pp S423-4.
41. *ibid*, p S426.

TABLE 5.2: DEFENCE'S ESTIMATED STAFFING FOR MCM FORCE

	Service	Civilian	Reserve
Present Strength	123	11	50
Required Strength(1)	345	33	276
Additional Manpower Required	222	22	226

Note:(1) These estimates include manpower for ships' complements (including four crews per COOP), base and forward support (eg, operations, supply, maintenance and administrative support) and the Mine Warfare Systems Centre. They are subject to further review. Manpower related to clearance diving and sound and DG ranges is not included because these have some broader naval applications than MCM.

Source: Department of Defence, *Submission*, p S393.

500 in the immediate term. While measures reportedly have been taken to address that problem, difficulties remain. As Defence advised this inquiry:

> The existing and predicted manpower shortfall means that to introduce an MCM capability the RAN will need to divert personnel from existing activities, with a consequent reduction in work capacity in other areas.[42]

5.43 Any diversion of personnel from other projects will address only part of the manning problem. The other part stems from the delays which have dogged some elements of the MCM project - primarily the MHI - and which throw out of kilter personnel training and skill retention programs. Defence has noted that the personnel skill base 'will stagnate' because those delays are upsetting the coordination of various components of the total project, and that 'the overall throughput of qualified and experienced minewarfare specialists will diminish'.

5.44 A major difficulty here is the matter of job satisfaction. MCM specialists who, on joining the force some years ago, could reasonably have expected to be using their skills fully by now, find instead that they could well be too senior for a posting to an MHI by the time the vessels are operational. The resultant job dissatisfaction is likely to be exacerbated by the disappointingly low level of interest in mine warfare shown by the ADF until recently.

5.45 It comes as no surprise to the Committee to hear of the 'higher than expected increase in the resignation rate of minewarfare specialists, both uniform and civilian'.[43] Defence has advised this Committee that since the MHI sonar problems were first highlighted in 1987 - bringing with it implications

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42. *ibid*, pp S426-7.
43. *ibid*, p S422.

for further delays - a total of 11 MCM specialists has resigned. The Committee is particularly concerned by the loss of RAN MCM specialist officers, and the high turnover of electrical engineers and computer-trained personnel at RANTAU's Minewarfare Test and Evaluation Group.

5.46 There are three main issues as far as personnel and MCM priorities are concerned: staff ceilings, job satisfaction, and wastage. The issues are interrelated and have the potential to develop their own negative dynamic.

5.47 We commented at length on staff ceilings in our report on personnel wastage, and consider that the conclusions drawn then remain relevant. It is sufficient to note again that inadequate establishment levels degrade capabilities and, by overloading people, generate wastage, thus compounding personnel management problems. Regarding job satisfaction, it is clear to the Committee from formal evidence and informal discussions that the delay in the development of the MHI is the key factor. If the delivery date continues to slip, further damaging losses from the small and highly specialised personnel base will occur. The recommendations we have made to revive the MHI program should resolve that problem.

5.48 The MCM project is particularly vulnerable to the effects of personnel wastage because, given the small numbers involved, the loss of only a handful of people can disrupt the whole effort. As we pointed out last year, equipment without people represents only part of the defence capability equation. It is essential to remember that the lead-time for recruiting and training people to an operational standard can be at least

as long as that required to acquire equipment. The retention of a skilled personnel base is fundamental if Australia is to regain an effective MCM capability.

5.49 We have also been advised that some MCM specialists have joined foreign defence forces as a means of remaining in their preferred field of employment. In keeping with the recommendation we made in our report on personnel wastage on re-employing former Service men and women,[44] it would be in the RAN's interests to try to re-engage those mine warfare specialists whose qualifications are still relevant to the ADF's needs.

Involvement of Australian Industry

5.50 The RAN's MCM program is a widely based in its approach to the difficulties inherent in conducting a military operation in the underwater environment. It involves design and construction work from a range of industries using many technologies. Some of that work has been contracted to Australian industry and includes civil engineering and building, shipbuilding, electronics manufacture and software development. Once the MCM force is operational, there will be a good deal of maintenance work, much of which will go to Australian industry. Appendix 1 provides details of work undertaken so far.

5.51 Because Australia's MCM force will be small, the amount of work will not be large and the income generated is unlikely to be crucial to the survival of many of the companies

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44. JCFADT, *op.cit.*, pp 189-92.

involved. Several of the equipments developed for the COOP program, for instance, have been selected to make as wide a use as possible of items already in commercial manufacture. Examples are the mechanical sweeps, which include components in commercial use locally; and the sidescan sonar, which is manufactured overseas for the offshore resource industry. MCM requirements would constitute a small component of total sales in those areas.

5.52 An exception to this may be the need to manufacture the permanent magnets for the dyad influence sweeps. At present there is no capacity in Australian industry for making permanent magnets. Although the dyads have shown good survivability in shock tests,[45] the normally high attrition rate of mine sweeping gear in operation suggests that usage will be sufficient to warrant the establishment of an Australian permanent magnet industry, perhaps based on the rare earth magnet technology developed by CSIRO.[46] No details of the likely cost of this proposal or of projected turnovers were available to the Committee, but this data should be known in the near future after Defence receives responses to an invitation to register interest, which will be released later this year.

5.53 The Committee supports the approach of attempting to base as much as possible of the MCM equipment on standard industry manufactures. However, the environment of MCM is one of the most complex in which the ADF operates, and there is an inevitable need to use high technology equipment, which in some instances will have to be imported. The Committee did hear some informal complaints from Australian industry that local manufacturers of high technology equipment were not given adequate consideration in the selection of some components of

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45. Defence, *Submission*, p S431.
46. *ibid.*, pp S432-3.

prototype systems. We recognise that judgments in these circumstances, where considerations of timeliness, effectiveness and budget are important, are always difficult; but note that the inclusion of appropriate items of Australian high technology manufactures into an overall system provides one of the few options for the indigenous development of this capacity.

5.54 During its consideration of the implications for Australian industry arising from the MCM program, there was one issue which particularly concerned the Committee, namely, the export potential of the MHI. Although we were apprised of examples of genuine interest in the craft,[47] we are aware of the significance which local environmental conditions and operational requirements exert on the selection of MCMV around the world. Because the MHI's design criteria were aimed specifically at shallow water hunting in sheltered harbours and approaches, its market is most likely to be a specialised one.

5.55 In this regard, the vessel's steep rise in total unit cost is likely to act as a disincentive. With the letting of contracts for the building of the prototype MHI in early 1983, approved expenditure on the two vessels reached $53m. This included items of non-recurrent investment, such as the building hall which eventually cost $12m.[48] As mentioned above, by the end of 1987-88 expenditure on the two prototypes had reached $82.6m. Although this included a component of developmental work, it has not resulted in any control of unit project cost, which the Committee is informed is now about $86m for each additional vessel.[49] This represents an extreme increase since early 1986, when the Dibb Report noted that the 1987-88 FYDP had provision for an approval of four additional craft at a cost of $211m,[50] or less than $53m apiece.

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47. Defence, *Evidence*, p 12.
48. T Young, 'The Australian Navy's Catamaran Minehunter', *International Defence Review*, 3/1986, p 300.
49. Defence, *Submission*, p S385.
50. Dibb Report, p 126.

5.56 Of this expenditure, only $14.5m represents the payment to Ramsay Fibreglass for the hull, an activity upon which that company is largely dependent because of the specialised nature of the construction hall, for which the MHI supplies 90% of turnover.[51] The remainder of the cost covers largely imported equipment (motors, submersibles, weapons and other systems), support and contractor services. This level of cost growth is likely to affect sales prospects adversely, as Defence has stated that it 'now appears that some larger coastal minehunters, if purchased overseas, could be of the same order of costs as the MHI'.[52]

5.57 The greatest impediment to any export prospects for the MHI, however, must be its present inoperative status. Although the components originally thought to be risky - particularly the construction technique and the hull's resistance to shock - have been proven, the vessel cannot be validated as a minehunter until a sonar can be demonstrated aboard it operationally. The failure of the sonar to perform to specification has left the builder, the Navy and defence exports without a vessel to demonstrate. This feeling, expressed generally by witnesses, was summarised by the Director General, Naval Warfare: 'The fundamental point that the lack of a minehunting sonar has damaged the prospects for sales must be conceded'.[53]

5.58 The Committee has been impressed by many aspects of the RAN's approach to MCM, including the attempt to maximise the use of existing Australian industry and infrastructure. It has been demonstrated to the Committee that MCM, and particularly minehunting, is as complex and technologically exacting as any other area of modern defence activity. In these

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51. Defence, *Submission* p S396.
52. Defence, *Submission*, p S385.
53. Defence, *Evidence*, p 12.

circumstances it is probably inevitable that a proportion of systems and related equipment will be imported, as is the case in other areas of defence procurement.

5.59 The Committee shares the enthusiasm for the advances offered by some of the technical innovations developed in support of the MCM program, and believes that these have significant operational and economic advantages for the development of Australian MCM. However, both in the light of its investigations of the MCM issue and its awareness of the experience of the Australian economy as a whole, we do not consider that technological breakthroughs or unique solutions are necessarily sufficient in themselves to gain substantial export sales.

CHAPTER SIX

POLICY OPTIONS AND RECOMMENDATIONS FOR THE DEVELOPMENT OF AUSTRALIAN MINE COUNTERMEASURE CAPABILITIES

6.1 The Committee believes that the MCM expertise in the RAN and the DSTO is impressive. That expertise will be the foundation for the development of the capabilities which are required to deal with the threat of mine warfare which may, at some time, face Australia. Much creative thought and original work has gone into the development of the concepts and equipment which are the basis of the RAN's current MCM program. However, some of that work originated prior to the endorsement of the current, more precisely defined defence policy, and consequently requires a considerable reappraisal to redress shortcomings. In this concluding chapter, the Committee addresses those issues.

Reviving the MHI Project

6.2 Some ten years after the minehunter weapons system project was initiated the MHI still lacks a suitable sonar. This delay has had two important consequences:

a. Australia's MCM capability has been effectively lost for the immediate future. HMAS CURLEW is due to pay-off in mid-1990; and there are few options for providing an alternative minehunting capability before that date. This situation has implications for operations, retention of skilled personnel, and development of the MWPS; and

b. the chances of gaining export sales for the craft have been jeopardised as without trials with a proven sonar there can be no assessment of the hull form's characteristics, and there is no operational vessel to demonstrate to buyers.

6.3 Both issues require urgent attention. It follows, therefore, that the main criteria for evaluation of options to rectify the situation must be speed of implementation and low development risk.

6.4 The options presented to the Committee have been to:

a. continue trials with the existing KAE sonar;
b. accept the offer from KAE to fit its new model sonar at a later date; or
c. examine alternative sonar systems.

6.5 Apparently the existing KAE sonar is experiencing difficulties in classifying return echoes under a variety of conditions. In order to determine whether a sonar echo has been generated by a mine, a mine-like object, or just rubbish, there has to be a means of classifying the nature of the target. The general method employed is the 'shadow technique', that is, analysing the shadow thrown by the object when it is 'illuminated' by sonar's sound waves.[1]

6.6 The trend in sonar development over the past 10 years has been towards systems integration. Emphasis has been placed on automating sonar by developing the system's signal processing capacity.[2] This is a feature of the KAE system, which does not use the 'shadow technique' but rather relies on computer processing of the echo itself for classification.[3]

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1. Defence, *Evidence*, p 39.
2. *ibid.*, p 36.
3. *ibid.*, p 39.

6.7 The difficulty with such automated analysis is that the algorithms devised to solve the problem must be capable of evaluating a wide range of variation in data. The variation in environmental conditions underwater - even in the same location on different days - greatly complicates predictions of the performance of the sonar and, therefore, the computation value the data it receives will carry.[4] Consequently, it is not surprising that refinement of the working algorithms apparently requires a lengthy trials effort.

6.8 In many of the operational uses of sonar it is the experience of the operator which determines the effectiveness of the search. Proven minehunting sonars use the 'shadow technique', in which it is the operator's skill in interpreting the shadow which provides the degree of confidence in target classification. This is especially important in the case of those mines designed to disguise the echo. The fact that HMAS CURLEW has been the trials vessel for evaluation of the performance of the DSQS-11H suggests that the human operator is still a good evaluator of sonar performance. It is also significant that the new KAE sonar being offered to the RAN uses the established 'shadow technique' principle.[5]

6.9 We appreciate that KAE management is making every effort to rectify the problem of sonar performance. The most recent public statement we are aware of appeared while this report was being drafted in March, and while further sonar trials were being conducted.[6] Unfortunately, the history of trials of the MHI sonar suggests that its problems are difficult to rectify, and appear to confirm previous MCM experience that searching in the undersea environment under operational conditions is a most demanding process.

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4. For a brief discussion of some problems in sonar performance, see Mark Hewish, 'High tech sweeps in equipment for naval mine countermeasures', *International Defence Review*, No.11/1988, p 1471 ff.
5. Defence, *Submission*, p S421.
6. A W Grazebrook, 'Some progress - some problems', *Pacific Defence Reporter*, March 1989, p 22.

6.10 In summary, the Committee concludes that proceeding with the DSQS-11H as the basis of restoring the RAN's MCM capability is too risky. It may involve further expense, and will probably take too long to bring to resolution. The option should not be proceeded with.

6.11 KAE has offered its new sonar, the DSQS-11M, as an alternative fit for the MHI. This system is being developed for the FRG Navy's MJ332 class minehunter but must be considered a 'paper project'. The prototype has not been completed and is not expected until the end of 1990. The first evaluation system is not due for transfer to the FRG-N until mid-1991.[7] Delivery of a system to the RAN would follow about six months behind the German schedule, i.e., it would not be available to start trials in Australia until early 1992.

6.12 The risk of the DSQS-11M program not meeting its schedule is assessed by Defence as medium to high.[8] This evaluation would seem to be prudent given past experiences with developmental MCM sonar systems. The Committee is mindful of the observation of the MRL's Chief of the Underwater Weapons Division that, in his 20 years of experience, no sonar had initially performed to designers' expectations; and achieving those expectations took anything up to five years.[9]

6.13 Development experience with current operational systems reinforces those observations. The Plessey 193M Mod 1 used by the RN in its *Hunt* MCMVs originated in the late 1950s and has been under continual development; while French systems are of common development origin and date from the late 1960s. Significantly, the new Raytheon system under development for the USN's *Avenger* class MCMV reduces the danger of unacceptable classification performance by integrating existing Thomson Sintra sonar components into its design.[10] From the viewpoint

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7. Defence, *Submission*, p S421.
8. *loc.cit.*
9. Defence, *Evidence*, pp 36-37.
10. Hewish, *op. cit.*, p 1472.

of evaluating an approach for reviving our MCM capability, it is relevant that the US has the same need for quick development of a neglected skill as does Australia.

6.14 Given the experience with the development of MCM sonars, and the importance of minimising decision-making risk because of the need quickly to restore the RAN's MCM capability, the Committee could not support the proposal to fit the MHIs with the KAE DSQS-11M sonar.

6.15 An RAN mission travelled overseas in 1988 to assess the availability of alternative sonar systems for the MHI, and identified two which were suitable.[11] Of these, one could be fitted to the MHI with little modification. Defence estimates that this system would not be installed in both prototypes until early 1993 if normal tendering procedures were followed. This program is assessed as being of low to medium risk.

6.16 The sonars assessed as being suitable alternatives are in service with several navies.[12] As such, they have considerable appeal to many potential overseas buyers, based on a record of proven performance and demonstrable product support. Unfortunately, there are, of course, no such data for the MHI; and there is no means of determining whether the systems will perform to specification, or whether the special characteristics of the catamaran hull form will have some influence on sonar propagation. Until those data are available, the sales prospects of the MHI are likely to be limited. The central issue in this situation is the inability of the RAN to conduct any useful trials of the MHI in order to prove its operational effectiveness. Further progress awaits the availability of an operational sonar.

6.17 Accordingly, the best option is that which allows the earliest commencement of useful trials. The Committee is aware that an alternative to normal procedures exists in a lease option which has been offered for one of the suitable sonars,

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11. Defence, *Submission*, pp S422-3.
12. *loc.cit.*

integrated with an MCM weapons system. We understand that the system could be installed in about 12 months from the time a decision was taken to proceed with single source procurement. If this option included an offer of a full training package and support, it would have added attraction. However, we would emphasise that the crucial issue for decision making is the selection of the option which facilitates the earliest possible trials for the validation of the MHI concept as a minehunter.

RECOMMENDATION:

> The Minister to seek a single source procurement of a proven integrated sonar system, exercising options other than purchase in the first instance if this will enable the earliest resumption of trials with the MHI.

The Concept of Operations

6.18 The Committee agrees with Defence that the concept of operations for MCM should be derived from Australian environmental characteristics. We support the focus on MCM operations in waters of 90m and less, against moored and bottom mines; and the requirement for the force to posses a mix of technical capabilities to counter the mine threat.

Distance and Mobility

6.19 Our inquiry has shown that a wide range of mine threats could be brought to bear against Australia with little preparation. It has also shown that any aggressor would have a considerable choice of targets, in a sufficient number of

diverse areas to stretch the RAN's MCM response. The Committee accepts that the RAN's MCM force will never be sufficient when compared to the extent of Australia's maritime approaches, shipping routes and the sheer distances of the coastline. Therefore, MCMV will be required to deploy over long distances under all conditions, arrive on station in operational order, and be capable of a high degree of self-support.

6.20 The size of the Australian continent and the practical operational problems it imposes are evident in data on deployment times for MCM forces provided by Defence. These indicate that distance by itself - even without consideration of the environmental changes in different locations - would impose significant complications on MCM operations, simply as a result of transit times (See Table 6.1).

6.21 From the Table it can be seen that MCMV based in either Darwin or Fremantle will take 5 days at 8kts to reach Port Hedland. Depending on weather, vessels with limited sea keeping qualities will take longer. Where distances exceed 1000nm, some MCMV will be forced to interrupt passage to refuel. Should MCM bases be established only in Sydney and Darwin, it would take 12 and 10 days respectively to respond to a mining threat in Cockburn Sound. If there were no MCM base in Darwin, it would take almost 13 days to deploy an MCMV to that area. Defence summarised the situation neatly in its submission:

> In summary, while there is a priority for the smaller MCM vessel designed to operate in confined waters, the distances between our major ports and the sea conditions which can be experienced in transit and when operating in many port approaches, indicate also the advantages of the larger MCM vessel that would be less constrained by open water conditions.[13]

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13. Defence, *Submission*, p S352.

TABLE 6.1: DEPLOYMENT TIMES

From	To	Distance (in miles)	Transit Time (Days) (8kts)	(10kts)	(12kts)
Sydney	Westernport	504	2.6	2.1	1.7
	Brisbane	523	2.7	2.2	1.8
	Cairns	1255	6.5	5.2	4.4
	Torres Strait	1730	9.0	7.2	6.0
	Darwin	2470	12.9	10.3	8.6
	Adelaide	970	5.1	4.1	3.4
	Fremantle	2313	12.0	9.6	8.0
Fremantle	Adelaide	1343	7.0	5.6	4.7
	Port Hedland	961	5.0	4.0	3.3
	Darwin	1841	9.6	7.7	6.4

Source: Department of Defence, *Submission*, p S352.

6.22 The Committee supports Navy's position regarding the importance of environmental conditions in planning MCM. We were advised that following recent consideration of mining operations, the Navy has now concluded that an opponent may lay mines in more exposed waters than previously thought likely.[14] That important conclusion represents a change from the strategic thinking in vogue when the MHI concept was developed. Further, Defence has concluded that an adversary could choose to escalate a dispute by mining open water port approaches.[15] Those factors clearly indicate that some elements of the RAN's MCM force will need good seakeeping qualities.

6.23 Navy is currently giving further consideration to the implications of Australian environmental conditions.[16] Rough weather conditions above sea state 3 occur 50% of the time in the north,[17] and even more frequently in some areas of the south. From December to February in the north west extremely rough seas associated with tropical low pressure systems occur about 15% of the time.[18] Crew efficiency can be expected to fall in vessels with poor seakeeping during bad weather.

6.24 The Committee endorses the need for MCM forces frequently to deploy during peacetime, both to develop their familiarity with different environments and to train for operations without base support. We appreciate that this objective could prove difficult under conditions of constrained budgets, and would point out that the effectiveness of the training cycle will be enhanced by good mobility and endurance in MCMV.

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14. Defence, *Evidence*, p 42.
15. Defence, *Submission*, p S366.
16. Defence, *Evidence*, p 18.
17. *ibid.*, p 26.
18. Stephen Youll, Commander RANEM, *The Northern Territory in the Defence of Australia: Naval Considerations*, Strategic and Defence Studies Centre, November 1987, p 3.

6.25 Small COOP suffer somewhat from their industry origins, in that much of the hull is occupied by fish tanks, which must remain in ballast to maintain the vessel's stability. Consequently, habitability is not ideal for long deployments. Whilst this is not a problem when vessels are in home ports or conducting local Reserve training, it may well limit their capacity to deploy for familiarisation training in other areas.

6.26 Support for deployed forces is an essential component of the MCM concept of operations. The Committee endorses the plan to draw upon the infrastructure of local ports.[19] The extent to which that support will be effective will, however, be influenced by the highly specialised nature of MCM. In particular, specialist support will be needed for intelligence (such as the MWPS), and equipment like navigation aids and on-board systems.

6.27 Defence plans to acquire two forward support units for deployed MCM forces. These will provide local command and control, maintenance, logistic and administrative support, and repair for action damage.[20] Current planning is that these facilities will be packaged into standardised containers, transportable by C130 aircraft or semi-trailer. The Committee was told that this might involve 8 to 10 containers.[21]

6.28 In our opinion the concept for the containerised support of MCM deployments needs further development, particularly given the support-dependent nature of the MHI. We believe that in many circumstances operation of the support units might prove impractical; while assumptions should not be made about the availability of the necessary transport. This leads us to conclude that the presence in the MCM force of some elements less dependent on ashore support would considerably enhance the force's deployment capability.

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19. Defence, *Evidence*, p 28.
20. Defence, *Submission*, p S387.
21. Defence, *Evidence*, p 28.

6.29 In summary, we endorse concepts associated with basing and training MCM forces in the north but are concerned that current equipment options do not easily conform to that policy.

6.30 The Committee considered alternatives which might improve the mobility of MCM forces, including the use of helicopters and airships. We consider helicopters modified primarily for MCM are too costly to be included in a balanced force at present, especially as they have little practical minehunting capacity with existing technology. Airships show potential for MCM operations, especially as ROV technology improves. However, the vehicles are as yet unproven in MCM. As our current priority is to overcome deficiencies in the RAN's capabilities quickly and with little risk, airships cannot be considered an option. They do, however, seem to offer considerable potential, and their development should be closely monitored.

6.31 The dichotomy between equipment and concept of operations is most apparent in the case of the MHI. The concept of the vessel predates the incorporation into defence policy of 'defence in depth' and the focus on the sea-air gap to our north. Unfortunately, the MHI's development has taken so long that its operational specifications have been overtaken by events. It cannot easily or effectively meet the broader concept of operations which Defence has now developed. Although the ability to participate in combined operations with regional nations is not central to the concept of operations, it is nonetheless a significent policy option which the MHI cannot offer government, because of its relatively restricted deployability. In short, it does not possess those broad characteristics identified in the White Paper as necessary for the ADF: 'range, endurance, and mobility, and independent logistic support'.[22]

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22. *The Defence of Australia*, p 31.

6.32 An exception does, however, exist in the need for protection of the south eastern major ports, the continued MCM defence of which the Committee judges likely to remain an issue throughout any conflict which may develop to the north. When that need for MCM protection is allied to the requirements of the Mine Warfare Systems Centre for trials and development, the provision of a number of MCMV in those southern ports is justified. Local conditions will allow the MHI to be a satisfactory option for those tasks.

6.33 Because three shipsets of equipment were procured when the project commenced, and construction materials sufficient for another hull were approved (under a skills maintenance payment to Ramsay Fibreglass), the construction of a third MHI has commenced.

RECOMMENDATION:

That until the MHI has been fully evaluated and proven, no further construction of this class be undertaken.

6.34 That recommendation, and the preceding discussion throughout this report on the priorities for our minehunting needs, leads logically to our third recommendation.

RECOMMENDATION:

That the further development of the minehunting capability for the RAN be directed towards the acquisition of coastal minehunters (MHC).

6.35 A number of factors will be critical to the decision-making process arising from these recommendations:

a. the need at an early stage for an alternative platform if the performance of the MHI remains unsatisfactory despite a change of sonar system;

b. the need for an MCM trials platform to replace CURLEW;

c. the need for sufficient numbers of platforms to sustain Navy expertise; and

d. a more practical deployment concept of operations.

6.36 Consequently, the selection criteria for the MHC procurement program must include the following:

a. a proven integrated system, including training, adequate self support, and a full MWPS capability;

b. speed of procurement, both to guard against possible failure of the MHI and take advantage of finances allocated in the FYDP, but which will not now be used on the MHI; and

c. any local production to be based on a coordinated ship, equipment, and support package to avoid a repetition of the MHI experience.

6.37 Local construction involvement must, however, be viewed as secondary to the need for speed in restoring the RAN's MCM capabilities. A procurement program in which the lead ship was purchased overseas would be consistent with those selection criteria.

6.38 Turning to the COOP project, our recommendation again flows logically from the discussion we have presented on Australia's strategic circumstances, and the types of mine warfare threat we may face. The Committee also notes the Dibb Review's emphasis on the acquisition of large COOP vessels.

RECOMMENDATION:

> In order to improve the deployability of MCM forces, priority should be given to acquiring large COOP platforms.

Operational Base Selection

6.39 Our review of the nature of the mining threat illustrated the difficulty of selecting MCM home ports. Areas which may be at risk will change according to: the level of the threat; an opponent's operational flexibility; the political strategies of both protagonists; and the opportunities for *minelaying, which will differ* depending on the deployment of ADF units. Defence shares that assessment, noting in its submission that: 'Considerations of which ports to keep open would be influenced by strategic assessments and the nature of operations at any given time'.[23] That statement illustrates the difficulties of deciding upon the deployment of Australia's MCM assets. The selection of appropriate areas to base MCM forces will inevitably involve a balance of judgments of competing factors.

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23. Defence, *Submission,* p S356.

6.40 In general, the Committee supports Defence's contention that the weight of a mining campaign during restricted hostilities would fall on the regions under dispute, and that these are most likely to be in the north. However, we would expand Defence's outlook with our assessment that hostilities could commence with 'terrorist' style mining of southern ports, and that mining could be the means by which a limited conflict would be escalated. Under any conditions, the safety of the fleet should be assured by provision of sufficient MCM assets to allow passage to be forced to the open sea.

6.41 Nevertheless, the likely nature of the threat indicates that substantial MCM capabilities should be based in the north. Although our strategic and threat analysis did not identify Darwin as a high priority mine warfare target, we accept that the balance of command, logistic and financial considerations, together with its reasonably convenient location, indicate that it should be the location for the first MCM force established outside the fleet bases at Sydney and HMAS STIRLING.

6.42 Current strategic developments also indicate that defence of our north east coast is growing increasingly important. As regards mine warfare, the Committee earlier identified the high level of opportunity for operations in the Great Barrier Reef. This arises from the conjunction of large numbers of transiting vessels, the restricted passage of the reef environment, the operation of important trading ports in the area, and the Reef's proximity to emerging areas of possible political instability. These factors point to a need for familiarity, speedy operational deployment, and proximity of support for MCM forces.

6.43 The most suitable port for an MCM force in the area is difficult to identify, as the Reef extends over 1000 miles. If the benefits of current investment in Defence infrastructure are to be maximised, Cairns would be the logical site. However, it is a considerable distance from Queensland's important export ports. Earlier, the Committee identified the need to sustain the ADF's logistics links during a period of escalated low level hostilities. Depending on the priority given to that activity, Townsville could be a useful location. To summarise, we believe MCM assets should be based in the Great Barrier Reef region, but further investigation of appropriate sites should be made before a decision is taken.

RECOMMENDATION:

> That the home ports for the MCM force be established at Sydney, HMAS STIRLING, Darwin and in the Great Barrier Reef region.

6.44 Once that stage of development has been reached, it may be timely to reconsider the balance of the force's deployment. This will be particularly so if current assessments of Australia's strategic situation remain valid, and low level contingencies still constitute the most likely threat to national security. In those circumstances the priority of the Pilbara area may increase after LNG exports are established. It may then be preferable to transfer forces from Darwin to the (planned) Naval facility at Port Hedland.

Precursor Sweeping

6.45 The Committee's recommendation to proceed immediately with an MHC program should partly satisfy this requirement, as the MHC should be capable of transporting its own drone boat.

Otherwise, we remain unconvinced of the suitability of the drone boat concept in all instances, given its associated deployment difficulties. Access to helicopters may still be required in some cases, and the capability to use them for precursor sweeping should be preserved.

6.46 Service helicopters are the only feasible option. The Committee is aware that problems of availability could arise, related to competing demands in a defence emergency. The capacity to use helicopters would be enhanced, therefore, if a wide range of Service machines were tested. Developmental work to trial and exercise sweeps, as already performed with the Sea King, would be required for the Chinook and Blackhawk helicopters, to validate the concept. Inter-Service co-operation might perhaps be more forthcoming if the Army and RAAF were reminded that their ports (Townsville and Weipa) might be targets for mining.

RECOMMENDATION:

> CDF to direct that the development of helicopter towed sweeps should continue, and be extended to include all suitable Service types. The capability should continue to be exercised on a basis adequate for retention of skills.

Offensive Mine Warfare

6.47 A credible offensive mining capability would increase the ADF's options in its conduct of operations at all levels of conflict, and could help the government to control any escalatory response in a low intensity conflict. The ADF's ability to demonstrate an offensive mine warfare capability is

central to establishing the credibility of such options. The Committee notes that there are several means of developing the capability: aerial delivered 'destructor' bomb conversions; surface vessel minelaying in unopposed situations; submarine laid mines; and submarine laid self propelled mines. The ADF currently is capable of laying destructor weapons from a range of aircraft including the P3, F/A-18 and F111.

6.48 Turning to defensive mining, we are aware that it would take about 12 months to begin production of suitable weapons. That time frame is consistent with current strategic analysis.

6.49 Other options which might be considered for the development of an Australian mining capability include the procurement of advanced overseas designed mines, or the incorporation of a minelaying capability into existing ADF units or procurement programs. Kockums is known to offer an integrated minelaying system for submarines which greatly increases capability, as the mines can be carried outside the pressure hull and therefore do not compromise the normal fit of submarine weapons. This option has not been ordered for the new submarine program, but were it to be included later in the production line, it would provide a significant demonstration of capability.

6.50 Any decision to use mines would depend on the assessment of whether it would be to Australia's advantage; and each situation would have to be judged on its merits. Clearly, mining would not constitute a significant deterrent if the opponent were a nation with very little maritime trade. It could be the case that Australia's strategic situation would preclude the use of offensive mining until a conflict escalated to the point where rules of engagement permitted the interdiction of naval bases. The possession of such a capability should help to deter an opponent's willingness to escalate.

6.51 The Committee understands Navy has developed a mine warfare concept of operations paper. We support the provision of such options to government.

RECOMMENDATION:

> That a visible offensive mining capability be developed for the expansion base of the ADF, including the procurement of modern mines and modest development of suitable deployment platforms.

Information, Surveillance and Support

6.52 The Committee's analysis of the possible mining threat indicated that the number of ports which could be actively protected in any circumstances would be limited, and that some losses of shipping would be unavoidable in the event of a sustained mining campaign. This has implications for the organisation of procedures to limit the extent of mining, to reduce its effectiveness and to provide for the security of citizens.

6.53 Such is the complexity of modern mines which could be used against Australia that detailed analysis and investigation may be necessary before MCM can proceed safely.[24] The Committee recognises that the effectiveness of MCM can be greatly increased by collecting information on mine technologies and on the local environment. The key to that process is the MWSC. One of its most important tasks will be to transfer existing MWPS printed volumes to electronic media for more effective organisation of MCM operations.

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24. Defence, *Submission*, p S358.

6.54 However, we are disturbed by the absence of contemporary data in the MWPS, a deficiency attributable to the effective loss of our minehunting capability. Defence has acknowledged that the preparation of these data requires a precision available only with minehunting sonar.[25] The Committee concludes that this further supports its recommendations concerning the MHI sonar lease and the procurement of MHCs.

6.55 Since the capacity of the RAN to conduct mine clearance operations in Australian ports will be limited, it will be of great importance during the course of hostilities to extend control of sea traffic around Australia, particularly during low level hostilities. Details of the extent of traffic in some Australian waters, as mentioned in Chapter 4, are surprising and the collection and analysis of data in this area would appear to be undervalued at present. Whilst the Committee realises that wide area surveillance technology will assist rectification of this problem once the Jindalee system, and even to some extent an AEW&C aircraft capability, is established, it must be recognised that in an operational situation such systems could be used by a miner to 'spoof' MCM forces.

6.56 There will be a requirement for operational surveillance over Australian waters during hostilities. The only organisation currently well situated to address this problem is the Bureau of Custom's Coastwatch system. The Committee is aware that Customs is studying options for further development of its operations, including the acquisition of more capable aircraft. Whilst this concern is not central to the Committee's investigations, we consider that future development of Coastwatch should evaluate options for co-operation with the ADF to provide intelligence during the conduct of hostilities.

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25. Defence, *Submission*, p S333.

6.57 It is self-evident that shipping control procedures will inhibit an adversary's ability to lay mines; from which it follows that those procedures should be an integral part of our surveillance system. Those ADF units which might be required to enforce such control should be granted as much legitimacy as possible for operations which, during low level hostilities, would involve a number of legal difficulties affecting the appropriate treatment of both citizens and foreigners. The Government's ability to sustain its political strategy should be enhanced by making the nation's legal rights as clear as possible in all operational areas. Undoubtedly, in open waters, this position is most clearly recognised in regard to a nation's territorial seas.

RECOMMENDATION:

> The Government to declare a 12 mile territorial sea consistent with the ratification of UNCLOS, and that this matter be pursued with some urgency.

6.58 In the event of hostilities it would be essential that danger to citizens should be reduced to the minimum and that the population be reassured of government's ability to cope with any damage caused by a mining campaign. The Committee is aware that Navy has prepared a seaward defence plan, based on the use of Reserve Officers acting as Port Defence Officers. We are also aware that most local ports maintain disaster plans, and have liaison links to local and State emergency services. It is apparent that port authorities are keen to be involved in the development of contingency plans, and that they and other maritime authorities have considerable capabilities to contribute to the preparation of naval port defence.

RECOMMENDATION:

The Minister actively to support Navy's concept for port defence; and that the concept be staffed at a central level with the objective of developing an organisation which can be exercised on a regular basis.

6.59 The availability of MCM forces during a mining campaign would be restricted. Even during clearance operations against a limited action, it may not be possible to detach units to ports in close proximity. It would assist the MCM effort if one port were designated for clearance, and traffic from the others then suspended. That strategy could be facilitated in areas of developed infrastructure if alternative transport modes were able to move produce to the designated port.

6.60 Information on the capacity of land transport to absorb those sorts of additional workloads is sketchy. It has been reported that railways could achieve greater efficiency in the movement of freight,[26] but precise details of the tonnages involved, the availability of purpose-built rolling stock, and the means of controlling sustained higher volumes of traffic, have not been well evaluated.

6.61 The Committee notes the appointment by the Minister of a consultant to report in part on the use of civil infrastructure to support the ADF.[27] It considers that this matter is one which could appropriately be taken up as part of that investigation.

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26. See IAC, *Government (Non-Tax) Charges: Public Rail Services*, Information Paper No 5, 21 Feb 1989.
27. Minister for Defence, *News Release*, No 46/89, 10 March 1989.

Australian Industry

6.62 Chapter 5 pointed out that there are limited opportunities for industrial development arising from the MCM program. There are overseas systems which are in competition, in similarity of concept if not exactly so in technology, with those developed in Australia. It is also apparent, since the payment to Ramsay Fibreglass is $14m per MHI hull, that something like 80% of the cost of the MHI is composed of imported systems and equipment. Consequently, the sales potential of the MHI depends largely on its characteristics closely matching those of potential buyers' operating environments, as otherwise its repackaged systems are merely in competition with packages offered, on possibly more attractive terms, by the system supplier.

6.63 A different outlook exists, however, for minesweeping systems, in view of their high usage rate both in training and operations. The Committee accordingly supports the establishment with Defence procurement finance of production industries directly related to the support requirements of MCM operations. A permanent magnet industry would be one appropriate example.

6.64 There are a number of Australian companies with expertise in particular areas of higher technologies relevant to the MCM program which could be funded to participate, if a broader level of industrial support is considered relevant to the development of future MCM capabilities. The equipments available from these sources range from navigational systems to small, remotely-controlled submersibles. These producers could become the source of MCM systems, but only at a cost of time delay and financial penalty; and the volume of production which might result would scarcely be sufficient to affect the viability of the companies involved.

6.65 This is a matter for judgment which is outside the Committee's Reference, but were it decided for national industry policy reasons to foster particular advanced-technology industries, there would be some scope within the MCM program to comply. However, to do this, the Minister would have to issue deliberate policy objectives and establish some form of specific management system to monitor implementation. In other circumstances the Committee sees little prospect of any significant advance in the capabilities of high technology industry resulting from expenditure on the MCM program.

6.66 Whilst many of the technical developments emerging from the MCM program have merit, this alone will not bestow a better than average chance of export success. In situations of specialised marketing, such as confronts the MHI, a concerted and targeted sales strategy will be necessary. With other components, such as the dyad influence sweep, any transfer of technology could assist potential aggressors in planning a mining campaign. Sales therefore are likely to be restricted.

6.67 Future prospects for exports of defence equipment may be affected by legislation presented to the Parliament in 1988 to change the Customs Act. Australia's experience in the export of military equipment in recent years is that quality of product is often less important than special conditions of sale. In this context, the modest prospect of exports deriving from the MCM program is not a factor sufficient to affect the development of force structure policy.

Force Structure

6.68 Given the number of possible targets for a mining campaign, the transit distances involved, and the time which could be required to clear a mined port, it is plain that Australia will never have too many MCM assets. Our investigation of the question has shown that Australia could not expect to keep open all major ports during a concerted mining campaign, or even perhaps one of limited scope. We have assessed that although the losses caused could be severe, the nation would withstand the economic impact, although with some hardship, particularly on a regional scale.

6.69 In the event of a conflict escalating to the level of open hostilities between Regular forces, it is most likely that the ADF's logistic network would have to be protected, particularly in the north of the continent. Hostilities at that level do not necessarily imply a decline into general war, but could be sustained at a controlled level, as was noted by the White Paper. In this form of conflict, where an opponent was attempting to weaken Australia's resolve by using manoeuvre of small units over the distances of the Australian north to overstretch the ADF, safeguarding logistics would be crucial.

6.70 Because of the nature of the transport infrastructure in the north, most of this logistics effort, and especially the large, bulky and liquid items, would depend on shipping. An increased naval effort to patrol the northern approaches and interdict hostile forces would also increase the target value of ports in the area. Their closure would result in significant difficulties for the support of ADF operations. As the Committee has noted above, this effort must become increasingly balanced between the north east and the north west of the continent.

6.71 Mining operations are applicable to all levels of hostilities. The nature of mines also makes them particularly useful as a means of escalating conflict. The high probability of mines being deployed against us in low level conflict means that our MCM capabilities must exist in the force-in-being. At the same time, the potential inherent in minewarfare for a rapid escalation of the level of the conflict indicates that the expansion base component of the ADF should include an element of MCM units with a long development cycle.

6.72 In view of this, the Committee considers that the minimum level for MCM forces maintained in the ADF is that required to keep open two northern ports in an escalated low level threat, whilst providing for security of operations from the main naval bases in Port Jackson and Cockburn Sound.

6.73 The Committee also strongly endorses the Defence position regarding the overall importance of the MCM infrastructure. This includes the MCM training school, the MWPS and elements for its operational application, magnetic and acoustic ranging facilities, and maintenance, communications and base facilities.[28] We note that Defence considers these elements essential for the expansion of MCM capability. The positioning of many of these units at HMAS WATERHEN requires the presence of a strong MCMV contingent in Sydney.

6.74 The MCM force levels proposed by the Dibb Review would have operational capacity limited to the clearance of only two priority ports. In our examination of the concept of operations, we have argued that one factor favouring the acquisition of MHC is their greater productivity when deployed. We consider that this factor should provide a greater rate of effort than was assessed by Dibb for the MHI. The MHC's ability to work around the clock (because it will not be limited by sea state to the same extent as the MHI) is particularly important.

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28. Defence, *Submission*, p S387.

6.75 The Committee has been impressed by the progress made with the COOP concept. We have been assured that the technologies involved do indeed represent a viable method both of meeting the requirement for minesweeping and of providing an expansion base for MCM which has a practical chance of success. A positive and imaginative development of the role of the Reserve in operating these vessels could produce sufficient trained personnel to expedite any expansion which might be required.

6.76 The Committee considers that a basic MCM force structure, suitable for peace time training, developing familiarisation with locale, and undertaking the ongoing process of the MWPS, might consist of two minehunters and two COOP in each of Sydney, Darwin and the Barrier Reef region. To meet the need to secure egress from HMAS STIRLING, and to develop an expansion base for the west coast, a minehunter and three COOP should be deployed to that base. Operational requirements dictate that the vessels based in the north and the west should primarily be MHC and large COOP. Apart from the occasional detachment of other MCMV to WATERHEN for trials and development, the Sydney base would comprise MHI and small COOP.

6.77 That disposition of assets means that no MCMV would be home ported in the south east outside Sydney. That would be consistent with our assessment that the threat in the area is low. Nevertheless, as we argued in Chapter 4, offensive mining could be conducted in the Melbourne/Tasmania region at short notice, and could affect the confidence of the shipping trade. The need to base a force in the Melbourne region therefore is indicated. In addition, Melbourne's role as a Reserve training port indicates an opportunity to expand in MCM. Two small COOP, crewed by Reservists, should be sufficient initially for both purposes.

RECOMMENDATION:

The MCM Force Structure to be:

- 3 x MHI
- 4 x MHC
- 11 X COOP (6 large; 5 small).

The force disposition should be as follows:

	MHI	MHC	COOP
Sydney	2	-	2 (small)
GBR	-	2	2 (large)
Darwin	-	2	2 (large)
Stirling	1	-	3 (2 large, 1 small)
Melbourne*	-	-	2 (small)

* Permanent attachment from Sydney home port

The existing Clearance Diving capability of three teams should be maintained.

6.78 The Committee's recommendations on basing options for MCM forces provide only a restricted capability at STIRLING, particularly for minehunting. At times the MHI will be unavailable and minehunters in the east are remote. Arguments have been presented above to suggest that the risk of sustained

mining during a regional conflict would be constrained by American presence. Nevertheless, some degree of reserve capability must be provided to ensure the safety of the western fleet. The Committee proposes that this be done by ensuring the availability of COOP(I) at Cockburn Sound.

RECOMMENDATION:

That two additional COOP be fitted for COOP (I) activities.

6.79 Defence has provided estimates of the personnel requirements for the MCM force structured according to current policy, which is based on six MHI and 10 COOP (see Table 5.1). Our recommendations on force structure should not significantly alter those requirements. The average crewing of a European MHC is from 25 to 40, somewhat greater than the 14 onboard an MHI. However, the requirements for ashore support is integral to the MHI concept and, although the support concept has not been fully developed as yet, it seems apparent to the Committee that there will be more personnel supporting the vessels ashore than are billeted aboard. Additionally, the MHI can only operate for 12 hour periods, and current Navy planning envisages the use of two crews to provide the rate of effort necessary during a mining campaign.[29] MHC carry sufficient crew to operate successive 12 hour watches, and most can deploy operationally for 10 days. The Committee concludes therefore that its recommendations will produce greater personnel productivity during a defence emergency.

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29. Defence, *Evidence*, p 27.

A Regional MCM Force

6.80 The force structure we have recommended is the minimum consistent with the threat assessment and concept of operations. As we have observed, the nature of mine warfare is such that the ADF probably would 'never have too many MCM assets'.

6.81 Recent MCM operations in the Persian Gulf and the Red Sea have been notable for their international cooperation. That cooperation has obvious advantages, for example, an increased rate of effort, complementary forces, possibly reduced deployment times, and sustained operations. Given that any MCM response required from Australia could well focus on international waterways and involve foreign flag carriers, there may be scope for the formation of a regional MCM organisation.

6.82 Unlike many defence activities, MCM is completely non-aggressive. It therefore may constitute an acceptable medium of defence cooperation for states which generally are opposed to military alliances.

RECOMMENDATION:

> The Government to investigate the possibility of forming a regional MCM force; and otherwise to pursue the conduct of bilateral MCM exercises with regional nations.

Allocation of Resources

6.83 Defence has allocated some $500m to the MCM projects currently underway,[30] and it estimates the cost of an MCM force of the size supported by the Committee at between $550m and $850m.[31] The Committee received evidence that Defence planned to spend the majority of funds already allocated in the 1989-94 FYDP. In reality, however, it appears that the hiatus in the MHI program will significantly curtail spending during the FYDP period.

6.84 On the basis of Defence advice that, under normal procurement procedures, an alternative sonar system is unlikely to be acquired and fitted to any additional MHI hulls until early 1994, it is apparent that little spending on this project would be possible during the FYDP. The four MHI proposed on current planning assumptions would cost $344m, compared with $106m for the COOP project and $40m for the MWSC. The minehunter component of the force is clearly the most costly, and if current policy is allowed to stand there will be a significant underspend on MCM forces during the FYDP.

6.85 We are concerned that this circumstance will inevitably lead to a conflict with the funding and management demands of the new submarine and ANZAC ship projects in the mid-to-late 1990s. Both projects are scheduled to be in full production by that time, and naval project management will be contending with both the demands of the programs and the loss of qualified personnel to the contractors.

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30. Cummins, *op. cit.*, p 2.
31. Defence, *Submission*, p S392.

6.86 For this reason the Committee has stated a priority for accelerated procurement options in the future development of the MCM force. If a single-sourced sonar could be fitted and proven to a satisfactory operational level in under two years, this should allow completion of the third MHI before the end of the 1989-94 FYDP. Similarly, if overseas procurement of the lead ship of a class of MHC could allow launch within four years, it would enable expenditure both on that vessel and on program development costs during the period. Program costs could include preparations for any Australian follow-on construction which was consistent with the strategic requirement for prompt acquisition of an MHC capability.

6.87 Because much of the time lost in developing MCM forces (due to the difficulties with the MHI) is unrecoverable, the level of expenditure currently allocated for the FYDP will be more than satisfactory for funding the Committee's recommendations during the 1989-94 period. The COOP project and the MWSC will be completed during that time, as could be a precursor sweep capability. COOP costs are comparatively modest, at about $3m and $8m for the purchase of small and large vessels, respectively.[32] Assuming that the large COOP were purchased and not leased, the additional cost would be about $12m. An additional set of sweeping equipment and two side scan sonar systems would also be required, but these would not add greatly to total MCM force costs.[33] The remainder of the MCM force, principally the MHC project, would require funding over the latter years of the 1990s. This in fact would be a timescale not much different from that of the MHI program which current policy would deliver.

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32. Defence, *Submission*, p S385.
33. The currently budgeted expenditure on the minesweeper project, less the cost of the 10 vessels, does not exceed $60m.

6.88 Defence has presented an assessment of the composition of the force structure for both lower level and more substantial hostilities which would conform to current policy (see Table 5.1).

6.89 The changes which the Committee has recommended would delete three MHI and substitute four MHC, as well altering the composition and numbers of the COOP element. Indicative prices of overseas MHC apparently are as well guarded as their technology. The only costs the Committee has been able to ascertain are the FY89 unit cost of the USN's *Osprey* class, at $US98.6m ($A120m[34]); and that of the British *Sandown* Single Role Minehunter, for which the estimated program unit cost is stg.30m ($A62.5m[35]) in 1987 prices. The batch ordering of four of those latter vessels by the RN at 10% less than expected cost[36] gives some confidence that this estimate may hold. However, neither of those vessels is designed to meet the operational requirements identified for Australian circumstances. They merely provide an indication of the types of costs of available vessels. There are at least four other proven types which could be contenders for an RAN acquisition program.

6.90 Defence's estimate that an overseas MHC could be acquired for a unit price of around $A100m[37] appears sound. Thus, it seems that the additional cost arising from substituting four MHC for three MHI would be in the region of $150m. That total should be reduced somewhat by using the existing third set of equipment for the construction of the MHI. The estimates do not allow for the costs of Australian construction of follow-on MHC, however, as no data for this option exist.

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34. Converted at a rate of $US1=$A0.82.
35. Converted at stg1=$A0.48.
36. *Statement on the Defence Estimates 1988*, HMSO, 1988, p 37.
37. Defence, *Submission*, p S385.

6.91 The Committee has not assessed the force structure and costs of an expanded capability for more substantial conflict, as the time already lost with the MHI means that any program to provide the minimum minehunting capability will not be completed for 7 to 10 years. We believe it would be appropriate at that time to review the threat, the progress in MCM technology, and developments in the Australian environment, to determine the best course for the further development of the RAN's MCM capabilities

The Program Priority for Australia's Mine Countermeasure Needs

6.92 In introducing the *Defence White Paper*, the Minister stated that clear strategic planning allowed an ordering of priorities which, together with tough financial management, would lead to an improvement in defence capabilities without real increases in expenditure. The matter of priorities was central to both the policy of defence self reliance, and the argument that Australia can be defended against those types of attacks which may arise. The nation's defence policy makers have presented a logical threat assessment, which in turn should identify the nature of likely attacks and the capabilities the ADF requires. As the Minister said, Australia can 'afford the defence we need, provided we focus carefully on our real priorities'.[38]

6.93 MCM unquestionably is a 'real priority'. As we have demonstrated, mine warfare is applicable at all levels of conflict facing Australia. The sea mine can be used with little warning; it is an easily-acquired capability; and is highly

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38. *Hansard*, Reps., 19 March 1987, p 1096.

likely to generate a disproportionate response. Effective MCM will be necessary to ensure that the ADF can function during most levels of conflict, and certainly once Armed Forces have come into open conflict. An MCM capability therefore has a priority for both the force-in-being and as part of the expansion base.

6.94 Shortly after presenting the White Paper, the Minister further developed the framework for the determination of priorities for the ADF. Should reductions in planned expenditure be unavoidable, they 'can be made with the minimum disruption because we have set down clear priorities for what we preserve'.[39] The Committee has made recommendations which will probably result in a modest increase in finance devoted to MCM over the mid-term future. We believe these are fundable, but have some concern about competition for funds beyond the 1989-94 FYDP. Should such clashes occur, or should there be reductions in the Defence Budget, we consider that the redevelopment of MCM capabilities should be given priority for the allocation of funds.

6.95 Not only is MCM highly relevant to the strategic situation, for both low level and high level contingencies, but it also is a capability which is almost lost. Its redevelopment, therefore, must be given priority over other capabilities equally appropriate but better represented in the force structure.

6.96 The Committee's brief did not include revising the FYDP, and it is not appropriate therefore to argue the comparative priorities of proposed force elements. However, we note that this type of exercise is frequently undertaken in Defence, and was adopted by the Dibb Review when assessing the

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39. The Hon. Kim Beazley, 'After the White Paper - the Challenge of Management', *Address to the National Press Club*, 25 March 1987, p 10.

feasibility of its force structure proposals. We particularly note one judgment of that Review, based on the estimate that four of the new generation of submarines would have a capability equivalent to the RAN's current force of six Oberons, and that Australia's submarine requirement was in general met by that force:

> Should cost pressures require re-examination of the (submarine) project, this extra margin of capability (i.e. new submarines 5 and 6) could be subject to scrutiny on the basis of comparison with higher-priority capability requirements, particularly those relevant to more credible contingencies, for example mine countermeasures forces and ground force mobility.[40]

6.97 At present, and at least until the level of force capability recommended by the Committee has been reached, the priority of MCM would validate such trade offs as a means of assuring the redevelopment of the MCM force. However, the Committee does not suggest that this form of reassessment is solely a matter for Navy. The availability of MCM has implications for the operation of all Services in Australia's north, and the evaluation of priority between projects should be made according to their contribution to joint operations and in the context of the development of joint ADF processes, which this Committee has strongly supported in earlier reports.

6.98 The current unsatisfactory state of the RAN's MCM forces has not developed because of ignorance of either the potential of mine warfare or the Australian requirements to counter it. The MHI has been accorded a 'high priority' since its approval in 1976. Yet despite this nominal management support for the project, some 13 years down the track the ADF today is on the verge of having no MCM capability.

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40. Dibb, *op. cit.*, p 123.

6.99 The Committee feels compelled to record its strong dissatisfaction with the fact that the MCM program has been so inordinantly protracted. We fail to understand why, when problems became evident, recourse to alternative strategies was not taken. It is clear that an MCM capability must rank equally in the RAN's force structure with submarine and surface warship components, but, because of its current state of decline, demands more urgency. In our opinion, Defence should re-examine its management procedures to ensure that its commitments to programming already underway, particularly the New Submarine and ANZAC Ship programs, do not materially interfere with the development of the RAN's MCM force.

6.100 As the Committee has stated above, MCM is as technically exacting and requires as great a commitment of expertise and funding as any other form of warfare. Difficulties experienced in developing the necessary capabilities required for the discipline cannot be left to solve themselves, without running considerable risks. During the course of the inquiry, the Committee was impressed by the technical expertise and dedication which the Navy's MCM force is able to apply to overcome the risks of hostile mining. We have, however, observed that the value of this resource and the need to support it has not always been given proper recognition at high levels within Defence. To ensure the future development of the RAN's MCM force, adequate managerial and technical support must be allocated by the Department of Defence and the ADF.

6.101 A former USN officer recently observed of his own Service:

> Clearly the historical record confirms that mine warfare is an integral element of naval power. It illustrates that maritime nations are vulnerable to mining in both home and distant waters. It shows that less developed nations and rogue political groups can wage

> effective mine warfare. And it demonstrates a record of interwar neglect of mine warfare in the US Navy that culminated in the Persian Gulf crisis of 1987 - when the world's foremost power failed to counter with any certainty the antique mines of a minor power despite knowing beforehand that mines would certainly be laid.[41]

6.102 Lest the same fate befall the Australian Navy and population at some time in the future, and in our own waters, it may be timely to recall the Oxford English Dictionary definition of priority: 'Precedence in order, rank or dignity'. The nature, timing and resource implications of the mine warfare threat to Australia clearly indicate the continuing importance of maintaining this capability in the RAN.

RECOMMENDATION:

> That the development of the Royal Australian Navy's MCM capabilities be accorded priority in the procurement, personnel and policy activities of the Department of Defence.

G N Bilney, MP
Chairman
May 1989

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41. Captain J F Tapley, USN (Ret.), quoted in Hinge, *Submission*, p S278.

APPENDIX 1

AUSTRALIAN INDUSTRY MCM INVOLVEMENT[1]

1. This Appendix outlines the implications of Australian MCM needs for local industry. It lists activities, either approved or under active consideration, by project.

Minehunter Inshore (MHI)

2. The vessels were designed by the Department of Defence (Naval Engineering Division) and are being built in Australia by Carrington Slipways Pty Ltd of Tomago NSW. Imported plastic foam is used in their construction but all other hull materials are derived from Australian sources. To date two prototypes have been constructed and pending successful trials and evaluation, a further four vessels are planned to be acquired. This Project has contributed 90% of turnover ($14.5m per hull) for the Fibreglass Division of the contractor. The high figure of 90% and the specialised nature of the facilities of the Fibreglass Division (quality standards are much higher than for normal commercial work in order to achieve high shock resistance) raises doubt that the work generated for it will continue after the project is completed unless there are export sales.

3. This project could further enhance Australia's shipbuilding capability and has export potential. Export sales will depend on successful completion of operational trials and the ability to demonstrate satisfactory performance. The other main avenue for providing work for the shipyard would be the construction of another class of ship, probably an MCMV. This would probably necessitate building the craft in the same

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1. Defence, *Submission*, pp S396-99.

construction medium ie foam sandwich GRP and would limit the size of the ship unless the facility was modified. Modification in turn would interrupt any shipbuilding activities until completed.

4. The minehunting weapons system of the MHI is largely imported with low local content but with an offsets program worth $4m (to date), involving the manufacture of radar transmitter modules by the Melbourne firm of ECM Electronics. With follow on orders a local content of 30 percent should be realised.

5. The significant items of equipment fitted to the MHIs - mine disposal vehicles, diesel engines, hydraulic transmission systems and propulsion steering units - also come from overseas sources.

Australian Exercise Mines

6. Six prototype 'Stonefish' exercise mines are currently undergoing trial and evaluation with 14 follow-on orders if proven successful; the cost is $0.4m per mine. The work thus far represents 15% of turnover for GEC-Marconi Australia, which is also receiving similar work from its parent company in the UK, Marconi Underwater Systems Ltd. Substantial technology transfer to Australian industry is taking place and the follow-on mines will be largely locally manufactured by GEC-Marconi Australia.

Australian Minesweeping Capability

7. The cost of this project is $106m. Civilian craft are being acquired and leased for the task. The navigation and surveillance system components are imported but system

integration is performed in Australia. Magnets for the magnetic sweeps are significant imported items for this project, although local manufacture for follow-on systems could be eventually realised by means of an invitation to register (ITR) interest for production of the magnets in Australia.

Shallow Water Sound Range

8. The cost of this project is $5.2m. The design and construction is Australian but some imported components are included. The contract was substantially completed in December 1987. A few teething problems exist at present but the system should be in operational service by early 1989. The contract represented a small part of Clough Systems Pty Ltd's $175m turnover for the past year. Clough Systems is a contracting company and the skills and expertise acquired during the project have been retained. For instance, the firm's expertise in project management and their electronic and software capabilities will be applied in other areas.

MCMV Degaussing Range

9. The cost of the project is $4.5m. Design and construction is substantially by AWA with the imported content valued at approximately $1.5m. This acquisition is a permanent capability.

Mine Warfare Systems Centre

10. The cost of this project is $40m. Most of the hardware is imported but 70% of the software engineering and system integration will be carried out by local firms.

APPENDIX 2

VISITS TO DEFENCE ESTABLISHMENTS

Date	Place	Activity
15 August 1988	HMAS PENGUIN	Briefings, Inspections
	HMAS WATERHEN	Briefings, Inspections
16 August 1988	HMAS CURLEW	Minesweeping Demonstration
	MRL, Sydney	Briefings, Inspections
31 October 1988	Jervis Bay	Briefings, Inspections
	HMAS BROLGA	Minehunting Demonstration
14 February 1989	MRL, Melbourne	Briefings, Inspections
17 March 1989	Naval Establishments and Port Authorities, Sydney area	Research

APPENDIX 3

WRITTEN SUBMISSIONS

APPENDIX 4

LIST OF WITNESSES

	Date	Place
Department of Defence		
Dr R G Brabin-Smith First Assistant Secretary, FDA	20 February 1989	Canberra
Mr I A Hagan Chief, Underwater Weapons and Countermeasure Systems Division, DSTO	20 February 1989	Canberra
Commodore H J Donohue Director General Naval Forward Planning	20 February 1989	Canberra
Commodore T A Roach Director General, Naval Warfare	20 February 1989	Canberra
Commander K I Green Commander, AMWF	20 February 1989	Canberra
Commander D N Bell Project Director, MWSC	20 February 1989	Canberra
Lieutenant Commander A T McIntosh Operations Manager, MWSC	20 February 1989	Canberra
The Returned Services League National Defence Committee		
Major General D Vincent Chairman	20 February 1989	Canberra
Commodore H J Adams Member	20 February 1989	Canberra
Rear Admiral J Davidson Member	20 February 1989	Canberra

Airships Pacific		
Mr R Frost Executive Manager	21 February 1989	Canberra
Mr Graham Winterbottom Military Marketing Manager	21 February 1989	Canberra
Brigadier J R Salmon Canberra Representative	21 February 1989	Canberra
Association of Australian Port and Marine Authorities		
Captain S J Costelloe Member	21 February 1989	Canberra
BH Pacific		
Mr H Julian Consultant	21 February 1989	Canberra

APPENDIX 5

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