THE NAVY CONTRIBUTION TO AUSTRALIAN MARITIME OPERATIONS

RAN DOCTRINE 2 - 2005

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THE NAVY CONTRIBUTION TO AUSTRALIAN MARITIME OPERATIONS

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FOREWORD

The Navy Contribution to Australian Maritime Operations is written to accompany *Australian Maritime Doctrine* and is closely linked to that principal volume of Royal Australian Navy (RAN) doctrine. Where *Australian Maritime Doctrine* focuses on the strategic rationale for and components of maritime operations, the purpose of this volume is to examine in greater detail the operational capabilities, and indeed limitations, of our Navy.

A key objective of this volume is to demystify maritime operations. It does not seek to provide a recipe book for meeting every conceivable maritime event, but rather to offer an accessible reference on how the RAN organises, prepares for and approaches operations in accordance with its philosophical doctrine. The most obvious linkage between the two volumes is the continued reference to the roles and tasks laid down in *Australian Maritime Doctrine*, but this volume also offers practical examples of the broader doctrinal principles at work in the modern RAN. Accordingly, this volume should further assist understanding of the nature of maritime power, and of the various and flexible ways in which each component of our Navy may be employed in response to government direction.

This volume represents an important next step in the evolution of the RAN's doctrinal thinking. It provides an authoritative guide to current structures, circumstances and conditions, and a basis from which future thought and development will proceed. Like *Australian Maritime Doctrine* this volume is a vital component of the training and education continuum of our personnel as well as those of the other Services.

The Navy Contribution to Australian Maritime Operations has been written at the unclassified level. I trust that it appeals to the widest possible audience and objectively informs debate on the range of capabilities available and required for the conduct of maritime operations now and in the future.

Unlike *Australian Maritime Doctrine*, which principally reflects the work of a small editorial group, *The Navy Contribution to Australian Maritime Operations* was developed from the individual efforts of many personnel serving at sea and ashore during the past three years. It is very much a book about today's Navy, written by a range of professionals drawn from every specialisation and major organisation within the RAN. While the coordinators of successive drafts of each chapter are known, all the contributors

are too numerous to mention and it would be wrong to discriminate among them by mentioning the work of some but not others. For this reason, individual contributions are not acknowledged in this volume.

Nevertheless, I am pleased to acknowledge the work of all concerned here and to commend their product to everyone interested in Australia's national security and the Navy.

C.A. Ritchie AO
Vice-Admiral, RAN
Chief of Navy

25 March 2005

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INTRODUCTION

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- *Australian Maritime Doctrine* contains the RAN's philosophical doctrine about operations in the maritime environment.
- *The Navy Contribution to Australian Maritime Operations* builds on *Australian Maritime Doctrine* to detail the composition, roles, tasks and capabilities of the RAN's major organisational elements.
- Government policy and parliamentary scrutiny have both reinforced the utility of a national maritime strategy over the past five years, while the RAN's understanding of the interrelationship between several components of its maritime doctrine has clarified in the same period.
- Several conceptual developments in Australia and overseas are likely to influence Australian doctrine in the foreseeable future.

THE CONTEXT OF *THE NAVY CONTRIBUTION TO AUSTRALIAN MARITIME OPERATIONS*

The Australian Doctrine Hierarchy

Australia's strategic military doctrine, from which all other doctrine is derived, is laid down in a single publication *Foundations of Australian Military Doctrine (ADDP-D)*. Two separate sets of doctrinal publications lie underneath this book:

- Australian Defence Doctrine Publications (ADDP), which are developed under the authority of the Chief of the Defence Force (CDF) for use throughout the Australian Defence Force (ADF); and
- Service publications, which are developed under the authority of the respective Service Chief.

Despite the great strides made in recent years to improve understanding through the development of agreed joint doctrine and terminology, a creative tension is always evident when the term 'maritime' is employed in the title of a Service-sponsored book that mostly contains single-Service matters. And the term presents some practical problems in the joint environment in which most western navies operate. In western military usage, the word 'maritime' is commonly used to describe the environment in which forces operate rather than to identify any particular Service that might provide forces to that environment. Maritime doctrine is therefore that component of doctrine which sustains the employment of armed forces at and from the sea.

Royal Australian Navy Doctrine

> Most navies are provided for similar purposes; the deterrence of war, the prosecution of war should deterrence fail, and the protection and advancement of national interests in times of peace.
>
> Captain W. T. T. Pakenham, RN
> *Naval Command and Control*, 1989

While the truth of Captain Pakenham's observation is apparent, the ways and means used by the world's navies varies widely in their pursuit of the common ends he defined. In order to explain its purposes more clearly to a wide and public audience, the RAN has developed two publicly available books containing its strategic-level doctrine. The first, *Australian Maritime Doctrine: RAN Doctrine 1 - 2000* (AMD), contains the RAN's philosophical doctrine about operations in the maritime environment. Initially published in 2000, it explains how the RAN thinks about, prepares for, and operates in peace and conflict. Beginning with a description of our maritime environment and of maritime strategic and operational concepts, AMD sets out the RAN's place within a joint and integrated ADF and its roles in Australia's military strategy. AMD therefore concentrates on the broader strategic issues that can be paraphrased in the questions: *What utility do armed forces have in the maritime environment, and why?*

The Navy Contribution to Australian Maritime Operations

The book you are reading – *The Navy Contribution to Australian Maritime Operations: RAN Doctrine 2 - 2005* (NCAMO) – builds on these philosophical principles to provide greater detail on the composition and role of the RAN's major organisational elements and the capabilities each provides as a component of the developing joint, seamless ADF. Chapters 8-16 of NCAMO explore the operating environment, roles and tasks of

each of the RAN's major operational outputs. These chapters outline the practicalities of each major Navy task within the capabilities of the current RAN force structure, and demonstrate how individual unit and force capabilities may be employed to protect Australia's national interests.

These capabilities do not spring from a vacuum; therefore, the context in which they operate is explored in the chapters that envelop them. Chapters 2-7 review in detail some enabling activities outlined briefly in AMD, such as command and control, maritime logistics, and force preparation and reconstitution, while Chapter 17 outlines some common future trends that influence operations today and will guide development of the future RAN.

However, NCAMO does not exhaustively explore the entire spectrum of maritime operations that the RAN might undertake. Even if such a book were limited to predominantly single-Service operations, the potential combinations of tasks and forces assigned would introduce details that would inhibit its scope and imply degrees of relative importance between capabilities that might not exist in some circumstances. More importantly, the increasingly joint nature of ADF operations would require a thorough investigation of a range of capabilities – most obviously land, air, intelligence and logistic support – which lie outside the RAN's organisational boundary. The philosophical basis for employment of all of Australia's defence assets in the maritime environment rightly lies in AMD, but the practicalities of employing the non-Navy assets should be explored in publications written by the principal operators of those capabilities, rather than by the RAN.

NCAMO, therefore sets out a body of application doctrine; it is much more of a handbook on the RAN of today and the immediate future, and could be considered to address the general questions: *What is each principal element of the RAN, and how does each operate?*

Relationship between the RAN's Doctrinal Publications

Readers familiar with the first volume of AMD will see that NCAMO presents two difficulties endemic to the maintenance of doctrine: some of the NCAMO material might overlap that of AMD, while some of the detail covered here is arguably well enough established to belong in the first volume.

Doctrine is regularly reviewed in the light of developments in history, theory and technology. Thus, some of the components of maritime doctrine date from the pioneering works of the maritime school of strategic thought – authors such as the classical naval strategists Mahan, Colomb and Corbett – while other components were first enunciated as recently as 2000. While AMD contains the doctrinal concepts that sustain all three Services in the maritime environment, it is nevertheless the principal work of RAN doctrine. Doctrinal publications issued by the Australian Army and the Royal Australian Air Force provide similar coverage of land and air strategic thought, while also focusing on their Service's contribution to the joint battle.

The well-tried, fundamental principles of maritime operations outlined in AMD are not static – AMD would be a book of dogma if that were the case – but its content is as enduring as any can be in our changing world. For this reason, AMD is the superior of the two publications, and its content is not explored in NCAMO unless two criteria are met:

- our understanding of the material has changed since 2000; and
- our new understanding needs to be recorded in NCAMO for it to present a coherent overview of current RAN capabilities.

The section in this chapter on *Developments since Australian Maritime Doctrine was published in 2000* presents an example of these criteria in action. The defined, specialist terms used in this publication are underlined in the text, their definitions appear in the *Glossary*, and a comparison between the respective 2000 and 2005 *Glossaries* will reveal changes to the definitions of a number of these terms as well as the introduction of several new terms. More particularly, Chapter 16 outlines a significant doctrinal change that has resulted from the increasingly open and voluntary nature of the maritime trade industry. Today, the RAN undertakes a range of protective measures under the title of Naval Cooperation and Guidance for Shipping in lieu of the earlier and more prescriptive Naval Control and Protection of Shipping organisation.

The wider public well understands that the pace of technological change will not slow, and it follows that the RAN will continue to adapt to new challenges and absorb new capabilities. As NCAMO is based on the RAN's current structure, much of its content will be authoritative only until that structure, its current capabilities or the underlying operating concepts alter. Some of this change may occur within the revision cycle of the book; hence, we must keep these potentially transitory matters separated from the more settled detail found in AMD. Conversely, some reasonably settled issues that are necessary to a holistic overview of the maritime operating environment do not currently appear in AMD. These issues are therefore explored in this book, pending a review of AMD.

Australian Maritime Doctrine will continue to evolve as the philosophical basis for the RAN's activities, dealing with well-established matters such as international maritime law, Australia's maritime environment, maritime strategic theories, operational concepts and campaigning principles. Successive revisions will more closely identify it as the book describing what the RAN does and why, while NCAMO will more clearly be identified with describing how the philosophies outlined in AMD are applied in the current and planned future Navy. All references to AMD in this book are necessarily to the 2000 edition, and the reader should bear in mind that as soon as the revised edition has been published, these references will need to be cross-checked.

This distinction between AMD and NCAMO is also intended to avoid the damage that can follow when the definition and application of doctrine is confused with the purposes and uses of systems or processes, such as have been identified by Andrew Gordon in his book *The Rules of the Game*. Both of the RAN's books on strategic-level doctrine are essential to understanding today's RAN. But today's structures and processes may not be in place tomorrow, and care is being taken to progressively separate them from the established foundations to which only gradual change will occur.

DEVELOPMENTS SINCE *AUSTRALIAN MARITIME DOCTRINE* WAS PUBLISHED IN 2000

Defence White Paper 2000 & Defence Update 2003

Australia's current military concept of strategy was established in the government's policy paper *Defence 2000: Our Future Defence Force*. The government has directed a maritime strategy to achieve Australia's enduring strategic preference to resolve any military threat to the Australian mainland by achieving decision in our maritime approaches rather than on or over the mainland itself.

In 2003, the government's paper *Australia's National Security: A Defence Update* determined that the threat of direct military attack on Australia had reduced since 2000, but that Australia's geographic advantages do not protect it from the new global uncertainties of weapons of mass destruction, long-range ballistic missiles and terrorism. Some rebalancing of the existing force and future priorities was announced to counter these developing uncertainties.

Parliamentary Inquiry into Australia's Maritime Strategy

In 2004, a committee of the Australian Parliament reviewed the current maritime strategy. This committee's report was significant for several reasons:

- while endorsing Australia's need for a truly maritime strategy, it also noted that such a strategy extends further than a sea denial capability in the maritime approaches;
- the discussion of Australia's need for such a strategy was couched in the accepted lexicon of the maritime school of strategic thought (as found, for example, in AMD); and yet,
- the committee's identification of greater changes to land and air rather than just naval capabilities in pursuit of the strategy confirmed the joint nature of Australian operations in the maritime environment.

Development of Strategic Doctrinal Thought

Increasing familiarity with *Australian Maritime Doctrine* has brought widespread acceptance of its strategic precepts, and several suggestions for refining the framework within which the detail outlined in Chapters 5-7 of AMD is presented. The revised structure outlined below has been developed in an attempt to more clearly outline the relationships between the individual components of maritime concepts and operations. Because the definitions have not changed, the relevant chapters in AMD must be consulted for a full understanding of each component.

Key Maritime Operational Concepts

At the philosophical level, the key concepts of *Australian Maritime Doctrine* are sea control, sea denial, maritime power projection and sea lines of communication. These concepts, which express ideas and theoretical constructs that permit further exploration and definition of what navies exist to do, and how they fulfil those functions, are discussed in AMD Chapter 5.

The guiding principle that links these concepts is that maritime forces seek to establish sea control and/or sea denial in order to:

- conduct the military task of maritime power projection, and to
- permit the use of sea lines of communication by military, commercial and private shipping.

Enabling the Concepts: the Characteristics of Maritime Power

Australia's maritime doctrinal concepts are enabled through the characteristics of maritime power discussed in AMD Chapter 6:

- mobility in mass;
- readiness;
- access;
- flexibility;
- adaptability;

- reach;
- poise and persistence; and
- resilience.

Applying the Concepts: Maritime Roles and Tasks

The philosophical concepts of sea control, sea denial, maritime power projection and sea lines of communication are applied through maritime operations that reflect one or more of the range of maritime roles and tasks.

As outlined in AMD Chapter 7, the roles of maritime forces are characterised by the RAN as being Military, Constabulary or Diplomatic in nature. The tasks that maritime forces undertake in fulfilling these roles are also recorded in that chapter, and are illustrated in what is currently described as the Span of Maritime Operations or the 'triangle of sea usage' on p. 57 of AMD.

The Span of Maritime Tasks

This triangle in AMD attempts to illustrate the relationship between the Military, Diplomatic and Constabulary roles and the subordinate tasks of maritime forces, rather than to be specific about the divisions between each. In 2003-04, a review of RAN operations since 1990 conducted by staff members of the Sea Power Centre - Australia revealed several potential anomalies in the existing diagram, and allowed a number of conclusions to be drawn about the efficacy of the AMD triangle and the placement of tasks on it. An alternative diagram, shown below, was then developed in an attempt to avoid the anomalies that can develop in a visual representation of all the tasks that the RAN undertakes.

Alternative Span of Maritime Tasks

The results of this research are published here to assist understanding of the interrelationships between maritime roles and tasks, pending a formal review of the current construct in AMD.

The Potential Impact of Emerging Concepts on *Australian Maritime Doctrine*

Joint concepts that will lead to a more fully integrated ADF are being developed from the fundamental understandings embedded in current Joint and Service doctrine. Where doctrine reflects proven precepts and drives the employment of current and immediate future capability, these joint concepts express aspirations that, if fully developed and accepted, will drive future capability development and ultimately influence changes to

doctrine. While these concepts have not yet been developed or implemented sufficiently to illuminate Service doctrine, their growing influence should be recognised here.

Network Centric Warfare

Network centric warfare (NCW) is an approved ADF concept that is already driving decisions on future capability. NCW is one of several terms used internationally to describe the way military forces will fight and be organised in the information age. Given that the naval fire support plans employed in support of the Allied troops on the Gallipoli Peninsula demonstrated the principles required in a 21st century networked force, it is tempting to view NCW as merely a logical step in harnessing new and existing technology to the service of armed conflict. However, NCW has the potential to change operating cultures and procedures, such as giving the unit possessing the best situational awareness the ability to control the firing of weapons by units remote from its locality. The concept holds great promise for a commonality of understanding between friendly forces, even if the extent to which its implementation can impact on maritime geo-strategic realities is not yet clear.

Effects Based Operations

Effects based operations (EBO), while still an embryonic concept, has now become a central tenet of Australian Defence Organisation (ADO) thinking. Future operations will most probably be expressed in effects-based terms, and the developed methodology is expected to become a significant driver of both current operations and future development. Mapping of capability in effects-based terms can be expected to further illustrate the ubiquity of maritime platforms in peace, tension and conflict.

Sea Basing

While not yet an Australian development concept, the ADF's increasing interoperability with the United States (US) will improve our access to and understanding of the United States Navy's (USN's) sea basing aspirations and capabilities. While any ADF implementation is unlikely to approach the scale of the US national effort, the potential that this concept offers to reduce our logistic footprint ashore is obviously attractive.

THE LAW OF THE SEA AND NAVAL OPERATIONS

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- The *1982 United Nations Law of the Sea Convention* defines maritime zones within which certain activities may or may not take place. Warships have particular rights and duties within specified zones. This may have an influence on how naval operations are conducted.
- The Law of Armed Conflict places specific restrictions on how warfare may be conducted at sea.

This chapter examines the application of the *1982 United Nations Law of the Sea Convention* (LOSC) to naval operations. It defines the level of jurisdiction of the coastal States over the different maritime zones and examines the navigation regimes for each of these maritime zones. The chapter also briefly outlines the laws of naval warfare applicable to RAN operations.

THE *1982 UNITED NATIONS LAW OF THE SEA CONVENTION*

The LOSC took nearly 20 years to negotiate. Australia ratified the LOSC on 5 October 1994. The LOSC entered into force for Australia and other original States parties on 16 November 1994.

There are in excess of 145 States parties to the LOSC, and more than 155 signatories. The LOSC codifies much pre-existing customary international law such as the concepts of innocent passage and high seas freedoms. In those areas where the LOSC merely restates customary international law, the principles are binding on all States whether or not they are parties to the LOSC. However, the LOSC also represents recent developments in the law of the sea such as the exclusive economic zone (EEZ), the concept of deep sea-bed mining as the common heritage of humanity, and the concept of the archipelagic State. These new concepts are only binding on States parties to the LOSC, as they do not form part of customary international law.

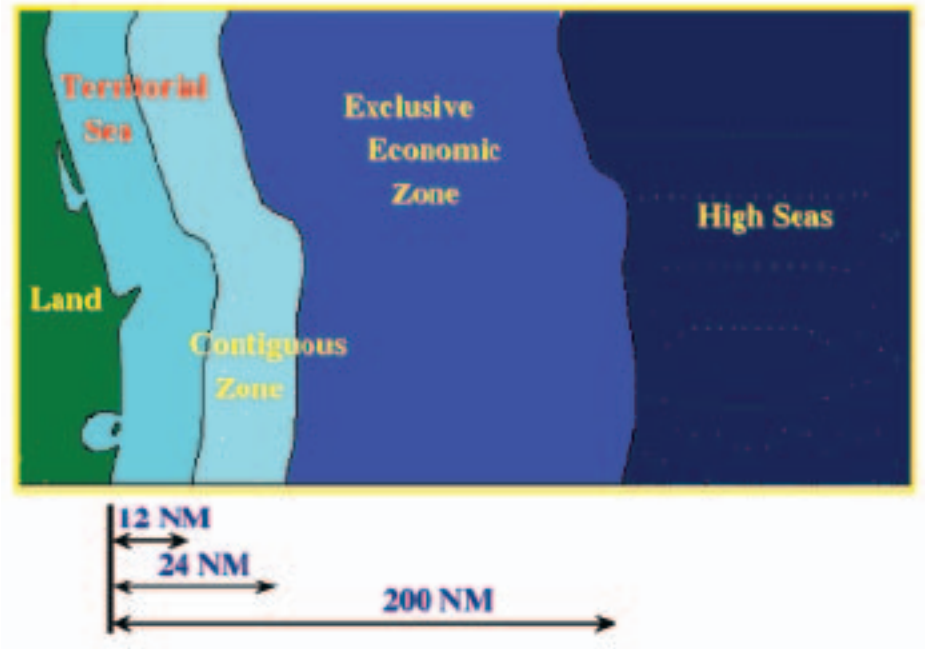
Maritime Zones

The LOSC defines maritime zones or subsets of zones in which RAN operations may occur. Zones are measured from baselines, which normally follow the low-water line of a coastal State, as shown in the accompanying diagram. Where the coastline is deeply indented, has fringing islands or is highly unstable, straight baselines may be used. Australia's baselines use a combination of the low water line based on the lowest astronomical tide (LAT) and straight baselines. Australia formally proclaimed its original baselines in 1983.

The maritime zones in LOSC are:

- internal waters;
- territorial sea;
- contiguous zone;
- archipelagic waters;
- straits used for international navigation and routes of similar convenience;
- EEZ;

- continental shelf; and
- the high seas.



Maritime Zones

Maritime Boundaries between States

States with opposite or adjacent coasts may need to enter into a maritime boundary limitation agreement to define the extent of their maritime zones. International law and LOSC provide little guidance on how maritime boundaries are to be delimited where zones potentially overlap. The LOSC indicates boundaries for the territorial sea, EEZ and continental shelf may be concluded by agreement, or be determined in some other manner to produce an equitable result. While such a result will often be an equidistant or median line between the coastlines, this will not always be the case. State practice has indicated other criteria may be relevant in the delimitation of a maritime boundary such as historic use or natural prolongation of the coastline. However, a definitive methodology is yet to emerge.

Australia shares maritime boundaries with France, the Solomon Islands, Papua New Guinea, East Timor, Indonesia, New Zealand, Norway (in the Australian Antarctic Territory) and possibly Vanuatu. Australia has aimed to achieve workable and practicable maritime boundaries with its neighbours. As a result, most of Australia's potential maritime boundaries have been determined. Australia's flexible approach in negotiating with other States has resulted in some of the most complicated maritime boundaries in the world. For example, Australia's agreements with Indonesia result in different boundaries for the EEZ and for the continental shelf such that sections of Australia's continental shelf are located under the water column of Indonesia's EEZ.

Internal Waters

Internal waters include ports and harbours, enclosed bays and gulfs, lakes, rivers and all inland waters. The coastal State has sovereignty over its internal waters. This should not be construed as conferring upon it unlimited power. The coastal State has duties for the promotion of international intercourse, navigation, and trade which customary international law imposes upon it. There is an implicit expectation of transit through the internal waters to a port or harbour for foreign vessels that are engaged in trade, but a coastal State may still close its internal waters to foreign vessels. Warships must generally seek diplomatic clearance for permission to enter internal waters.

The Legal Position of the Warship

While a warship is lawfully within foreign internal waters, it is sovereign immune from local jurisdiction and remains under the exclusive jurisdiction of its flag State. No legal proceedings may be taken against the warship and no official of the foreign State is permitted to board it against the wishes of the Commanding Officer. The warship cannot be arrested, detained, or searched and the only sanction that may be imposed on it for breach of the coastal State's laws is to require it to leave. However, the existence of this immunity does not mean that the warship can disregard local law. By accepting the hospitality of the port, the Commanding Officer and crew of a warship on behalf of its flag State tacitly agrees to observe the local regulations with regard to such matters as rules of the road, navigation and anchorage, health and quarantine restrictions and control of pollution. Failure to observe such local laws may afford good grounds for diplomatic protest by the coastal State to the flag State of the warship. If a warship persists in committing offences against the coastal State's law it could be required to leave the coastal State's internal waters.

The boats of a warship are entitled to the same privileges and immunities in a foreign port as the warship itself. Ships' boats invariably fly their national ensign during daylight hours in order to claim the privileges and immunities. Military aircraft and government

ships and aircraft operated for non-commercial purposes are also entitled to claim sovereign immunity.

The Legal Position of the Crew

The privileged status of a warship does not extend to the members of the crew. The flag State and the host State may have entered into a status of forces agreement or other bilateral arrangement that governs the application of the respective criminal laws of each State over crew members. However, in the absence of such an agreement, crew members are subject to the local laws of the host State just like any other visitor. Once a crew member is on board the warship, local officials are not permitted on board the warship to execute an arrest warrant or the like, without the permission of the Commanding Officer.

Territorial Sea

The coastal State has sovereignty over its territorial sea subject to innocent passage by foreign-flagged vessels.

Within Australia, the Commonwealth has ceded administrative control of the first 3nm of Australia's territorial sea to the States and the Northern Territory. As a result, within Australia there is a complex overlap and interplay between Commonwealth and State and territory laws. In essence, however, the Commonwealth's right to use these waters for national purposes, such as defence or navigational aids, has been preserved. The criminal and fisheries legislation of the States' parliaments may apply offshore, and may be enforced by the States. Members of the ADF enjoy powers under Commonwealth legislation to enforce Commonwealth laws in relation to fisheries, customs, migration and other issues.

Innocent Passage through the Territorial Sea

Ships of all States enjoy the right of innocent passage through the territorial sea. Submarines are required to navigate on the surface and show their flag while undertaking innocent passage. Aircraft do not enjoy a corresponding right of innocent passage. The airspace over a State, its internal waters and territorial sea is regarded as the national airspace of that State. Military aircraft seeking to overfly national airspace must seek diplomatic clearance. Civilian aircraft may also seek diplomatic clearance or be flying in an air route recognised by the International Convention on Civil Aviation.

A coastal State has the right to adopt laws affecting innocent passage, such as for navigation, safety, pollution control, marine research and hydrographic surveys, and

may on a non-discriminatory basis temporarily suspend innocent passage for the protection of its security. Any warship not complying with these laws may be required to leave the territorial sea.

Although the LOSC does not require prior notification, there has been a long-standing debate as to whether or not a coastal State can require prior notification or authorisation as a prerequisite for the enjoyment of innocent passage by warships of a foreign State. Australia's position is that prior notification or permission is not required for transit of the territorial sea in accordance with the regime of innocent passage.

The Contiguous Zone

Within the contiguous zone, the LOSC permits the coastal State to exercise the control necessary to prevent and punish infringement of its fiscal, immigration, sanitary and customs laws within its territory or territorial sea.

Australia's position is that maritime operations are unaffected by the contiguous zone of a coastal State except where such operations would infringe the coastal State's customs, fiscal, immigration and sanitary laws. The coastal State does not have sovereignty over the contiguous zone – it only has certain sovereign rights. Apart from the caveats implied by these sovereign rights, and its nature as part of the EEZ, the legal status of the contiguous zone is as high seas rather than national waters. As such, all ships have complete freedom of navigation through the contiguous zone provided their conduct does not infringe the customs, fiscal, immigration and sanitary laws of the coastal State.

Archipelagic Waters

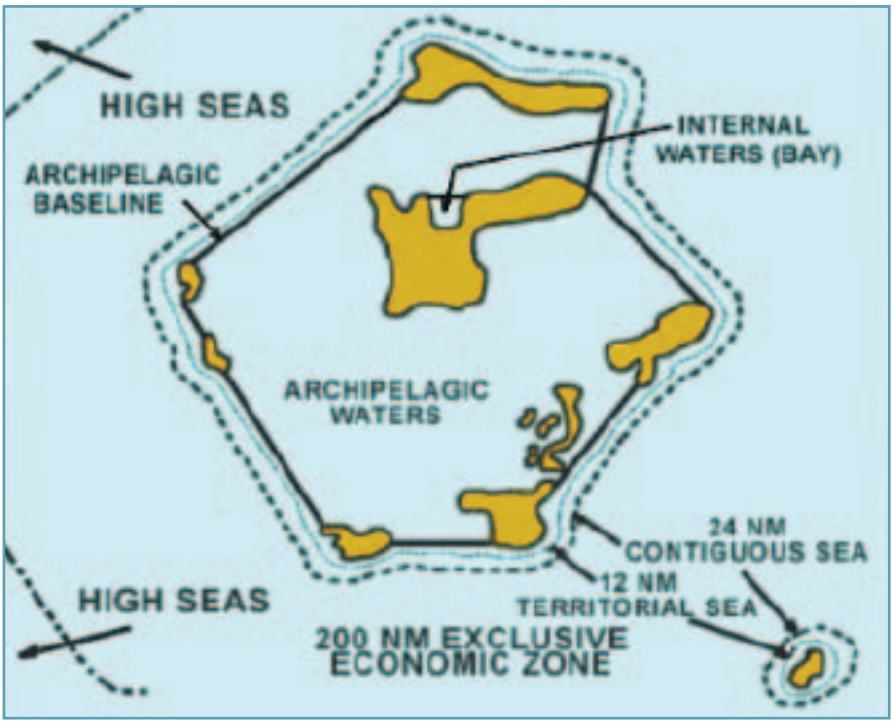
The archipelagic State has sovereignty over its archipelagic waters and may draw baselines to enclose internal waters. The territorial sea, contiguous zone and the EEZ are measured from the archipelagic baselines bounding the archipelagic State.

The archipelagic State may designate archipelagic sea lanes (ASL) and air routes that are suitable for the continuous and expeditious passage of foreign ships and aircraft through or over its archipelagic waters. In these ASLs, all ships and aircraft enjoy the right of archipelagic sea lanes passage (ASLP). Ships conducting ASLP are to comply with generally accepted international regulations, procedures and practices for the prevention, reduction and control of pollution from ships. While the archipelagic State has the right to temporarily suspend innocent passage after due notification it cannot suspend or hamper ASLP. Warships can exercise ASLP in normal mode, which permits submarines to transit submerged. However, if the archipelagic State has designated

ASLs, an aircraft is limited to overflight in the airspace above those ASLs.

If the archipelagic State does not designate such sea lanes, or where the designation is only partial, the right of ASLP may nevertheless be exercised by all nations through routes normally used for international navigation and overflight. Archipelagic States can designate traffic separation schemes.

Ships have the right of innocent passage through archipelagic waters that do not fall within ASLs, but not through duly promulgated internal waters.



Archipelagic Waters Regime

Straits used for International Navigation

Ships enjoy the non-suspendable right of transit passage through straits used for international navigation. Ships may undertake transit passage in normal mode and must comply with generally accepted international regulations, procedures and practices for safety at sea and the prevention, reduction and control of pollution from

ships. Importantly, States bordering straits, alone or in cooperation with other States, may adopt laws and regulations relating to the prevention and control of pollution in transit passage through straits used for international navigation.

Routes of Similar Convenience

Under the LOSC the regime of transit passage does not apply where the strait is formed by an island and its mainland, if there is an alternative safe route through the high seas or through an EEZ.

The general freedom of navigation exists through this alternative route of similar convenience. Where the route of similar convenience lies through the high seas or EEZ, the vessel is not bound to exercise continuous and expeditious strait transit and may loiter or conduct other manoeuvres. Ships entering the territorial sea of a State when using a route of similar convenience are conducting innocent passage.

Exclusive Economic Zone

The sovereign rights of the coastal State within the EEZ include the right to establishment and use of artificial islands, installations and structures, marine scientific research and the protection and preservation of the marine environment, and conservation and management of the natural resources of waters, whether living or non-living. The rights given to coastal States must be exercised with due regard to the rights and duties of other States, acting in a manner compatible with the provisions of the LOSC. Measures that may be employed to enforce the laws and regulations of the coastal State include boarding, inspection, arrest and judicial proceedings.

The EEZ regime preserves the high seas freedoms of navigation, overflight and submarine cable laying, and other internationally lawful uses of the sea related to these freedoms. Where rights are not allocated, any conflict is to be resolved on the basis of equity in light of all the relevant circumstances, taking into account the respective importance of the interests of the parties involved as well as to the international community as a whole.

Despite declarations by some countries that seek to limit military operations in EEZs, the LOSC allows maritime forces to operate with few, if any, constraints. Australia's position, in accordance with the LOSC, is that full military operations may occur in an EEZ. States exercising their rights or conducting military activities in another State's EEZ shall have due regard to the interests of the coastal State.

Continental Shelf

A coastal State has sovereign rights for the purposes of exploring the continental shelf and exploiting its natural resources. A coastal State has the exclusive right to construct and regulate the establishment and use of artificial islands, installations and structures, such as oil platforms. These rights derive from the coastal State's sovereignty over the seabed of the continental shelf. Vessels enjoy the traditional freedoms of the sea, subject to the rights of the coastal State.

The water column over the continental shelf may form part of the EEZ. However, where the continental shelf extends beyond 200nm, to a maximum of 350nm from the baseline, foreign States may fish in the water column above the continental shelf.

The High Seas

The concept of freedom of the high seas was one of the foundation stones of international law. It is based on the perceived characteristics of ocean space as indivisible and available. The concept that no part of the high seas can be subjected to sovereignty is balanced by the requirement that high seas freedoms must be exercised with due regard to other States in the exercise of their freedoms and for peaceful purposes.

Peaceful purposes do not preclude Australia from conducting military activities on the high seas. Instead, the phrase is a reiteration of the customary prohibition on the use of force contained in Article 2(4) of the United Nations (UN) Charter.

The ability of a State to exercise jurisdiction on the high seas arises from either universal jurisdiction, such as the piracy provisions of LOSC, or by virtue of being a flag State able to exercise jurisdiction over its flagged vessels. States may also influence the regulation of high seas activities by involvement in the development of international instruments under the auspices of the International Maritime Organisation. There are limited grounds upon which all States may take action against ships on the high seas. These include:

- duty to suppress piracy;
- duty to prevent slave trading;
- duty to suppress unauthorised broadcasting from the high seas;
- by specific agreement with a flag State for action against a specific ship;

- pursuant to relevant UN Security Council Resolutions; and
- under the laws of naval warfare.

States may also incur obligations or rights under other areas of international law that provide some basis for them to act on the high seas. For example, States are obliged to require Masters of their flagged vessels to render assistance to any person at sea in danger and to assist any ship after a collision. States are also obliged to cooperate in the suppression of illicit traffic in narcotic drugs and psychotropic substances engaged in by ships on the high seas contrary to international conventions.

Hot Pursuit

The LOSC provides for the concept of hot pursuit, which enables a coastal State to extend its jurisdiction over foreign vessels and foreign nationals on the high seas if it has a good reason to believe that the ship has violated the laws or regulations of the coastal State in its internal waters, territorial sea, contiguous zone, EEZ or on the continental shelf.

Pursuit must be conducted by a clearly marked and identifiable government vessel or aircraft and it must be commenced whilst the foreign ship or one of its boats is within an appropriate zone of jurisdiction and only after a visual or auditory signal has been given at a distance which enables it to be seen or heard by the foreign ship. It must be commenced as soon as possible after detection of the offence and it must be continuous, although the pursuit need not necessarily be by the same vessel or aircraft.

The right of hot pursuit ceases as soon as the pursued ship enters the territorial sea of its own State or of a third State. If the ship is stopped or arrested where hot pursuit does not apply, the ship is entitled to compensation for any loss or damage it may have sustained.

LAW OF ARMED CONFLICT

International law distinguishes between that body of law that governs the resort to armed force - jus ad bellum - and the law that regulates the conduct of an armed conflict - jus in bello.

Resort to Armed Force – Jus Ad Bellum

The LOSC does not address the law of naval warfare or the law of armed conflict at sea.

While many of its provisions are relevant to naval warfare - such as those specifying the maritime zones in which armed conflict can occur - in the main, it is necessary to consult customary international law and treaty law to ascertain relevant legal principles.

The law governing the resort to force has been neatly encapsulated in the UN Charter. Under Article 2(4), the Charter prohibits all Members of the UN from 'the use or threat of force against the territorial integrity or political independence of any State or in any other manner inconsistent with the purposes of the United Nations'. This principle is also reflected in customary international law. Two significant exceptions to this principle are also set out in the UN Charter, which permit States to resort to the use of force in either national or collective self-defence, or when collective action is authorised by the UN Security Council.

States are permitted to use force in exercising the right of national or collective self-defence. This national right of self-defence permits Australia to defend against armed attacks or certain injurious acts directed against Australia's national interests. Collective self-defence would permit Australia to defend another State from an attack should that State request assistance. In some cases, this collective self-defence notion is enshrined in specific bilateral or multilateral treaties such as the *ANZUS Treaty*. Action taken in self-defence must be strictly limited to the needs of self-defence and may not be converted into retaliatory or punitive measures. Measures taken in national or collective self-defence must be immediately reported to the UN Security Council.

> …Self-preservation – the first law of States even more than of men; for no government is empowered to assent to that last sacrifice, which the individual may make for the noblest motives.
>
> Alfred Thayer Mahan
> *The Influence of Sea Power upon History*, 1892

Treaty Law – Hague and Geneva Conventions

Simply put, international laws relating to armed conflict have traditionally been characterised as either 'Hague Law' or 'Geneva Law' although the degree of crossover is significant. Hague Law is concerned with regulating the methods and means of warfare, and is embodied in treaties such as the *Hague Convention Relative to the Laying of Automatic Submarine Contact Mines 1907* or the unratified *London Declaration Concerning the Laws of Naval War 1909*. Geneva Law on the other hand, is generally concerned with the protection of victims of armed conflict, under the auspices

of the four 1949 Geneva Conventions and their two Additional Protocols from 1977. This body of law is generally referred to as the law of armed conflict (LOAC).

General Principles of the Law of Armed Conflict

International law dictates that the methods and means of warfare are not unlimited. Armed conflict is regulated by the basic principles of military necessity, humanity and proportionality. The three principles cannot be considered in isolation of each other, and collectively they ensure that a conflict is fought as humanely as possible:

- *Military necessity* prevents a belligerent from taking action that is not otherwise prohibited by law, to secure the complete submission of the enemy as expeditiously as possible. It permits only those acts that are necessary for achieving a legitimate military objective;

- Traditionally, the principle of *humanity* - also sometimes described as the prohibition against unnecessary suffering - prohibits the use of means or methods of warfare which are calculated to cause suffering injury, or destruction not actually necessary for accomplishing legitimate military purposes. It is this principle which has seen, for example, the ban on laser-blinding weapons and certain types of anti-personnel mines; and

- Finally, the principle of *proportionality* provides a link between the concepts of military necessity and humanity. It requires that the losses resulting from a military action should not be excessive in relation to the anticipated military advantage.

The related principle of *distinction* requires that military operations be conducted only against the enemy's armed forces and military objectives. A belligerent force must distinguish combatants and military objectives from those who are non-combatants - civilians, prisoners of war, wounded, sick and shipwrecked, military medical and religious personnel - and non-military objectives. Belligerent forces must not deliberately target civilians and other non-combatants, or civilian property. Non-combatants and non-military objects are protected from attack; that is, they are not legitimate objects of attack unless they actually take part in, or are used for, military action.

Prisoners of War

The Third Geneva Convention Relative to the Treatment of Prisoners of War of 12 August 1949 provides guidance as to what categories of persons will be considered to be prisoners of war (POWs). The LOAC obligates capturing powers to treat prisoners humanely at all times and details the conditions under which prisoners must be kept.

While it does not specifically deal with POWs captured at sea, there is an obligation to evacuate POWs as soon as possible after capture to a 'camp' situated at a safe distance from the combat zone. POWs are to be kept in ships only for the minimum time necessary. They are to be provided with adequate food, clothing and medical attention. At the end of hostilities, all POWs are to be released without delay.

Rules of Engagement

The LOAC codifies important principles of international law, including a fundamental requirement of national control of military action. At the operational level, that control is exercised through the military chain of command with the promulgation of rules of engagement (ROE). ROE do not inhibit or replace but are part of the command function, and may be framed to limit certain actions. Alternatively, they may authorise actions to the full extent permissible under domestic and international law.

Commanders are not permitted to exceed these levels of authorisation without higher command approval, but the right of self-defence remains the implicit prerogative of every Commanding Officer or individual. RAN units and personnel operate under ROE at all times. ROE are drafted for particular operations or circumstances. ROE are always in accordance with domestic and international law.

The Law of Naval Warfare

A subset of the LOAC, which governs the means and methods of warfare at sea, is known as the Law of Naval Warfare. This law can be found in customary international law, various Hague Conventions, and the four *1949 Geneva Conventions* and their two *1977 Additional Protocols*. In 1994, a group of naval experts and lawyers published the *San Remo Manual on International Law Applicable to Armed Conflict at Sea*, which was an attempt to document customary international law in relation to naval warfare. Although the *San Remo Manual* is not a legally binding document, it is a useful guide to contemporary laws of naval warfare. The manual is only binding to the extent that its provisions reflect customary international law.

Special rules apply to conflicts at sea. Enemy warships, military aircraft, and naval and military auxiliaries may be attacked, destroyed or captured in any areas outside neutral jurisdiction and neutralised zones. Enemy merchant vessels are subject to capture and, in certain situations, may also be attacked if they meet the definition of a military objective.

There are other peculiar aspects of the LOAC that pertain only to maritime forces. For example, it is generally prohibited for land forces to disguise themselves as civilians or

as the enemy. Yet a warship is permitted to disguise itself provided it reveals its true character before engaging the enemy. This is a permitted ruse of maritime war.

Personnel who are wounded, sick or shipwrecked at sea must be treated humanely in accordance with the provisions of the *Second Geneva Convention for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea of 1949*. Military hospital ships that are built or equipped solely for the purpose of assisting the sick, wounded and shipwrecked, and which are appropriately marked, may not be attacked or captured. However, the fact that a warship has a medical facility on board does not render it a hospital ship.

Other Operations at Sea

Blockade & Visit and Search

Traditionally, a blockade could be established by a belligerent force against the coast and ports of its enemy to prevent vessels entering and leaving the enemy coastal State. Under customary international law, a blockade had to be declared and notified in advance to give sufficient time for vessels to leave the intended blockaded area; the declaration had to state the duration, location and extent of the blockade; it had to be applied impartially to all ships of all nationalities; and it had to be effective. A vessel that breached the blockade was liable to be attacked.

Once an armed conflict has commenced, warships have a belligerent right of visit and search which enables them to visit a vessel to determine the true character of that vessel. Merchant vessels are obliged to provide information about their flag, destination and cargo.

The regimes of blockade and visit and search are legally different from operations authorised under UN Security Council Resolutions. However, in operational practice there are obvious similarities. It is also possible that both the law of naval warfare and UN Security Council enforcement regimes may simultaneously apply to the same naval operation.

United Nations Operations

Under the UN Charter, if the Security Council determines that a situation exists that threatens international peace and security, it can take action to maintain or restore international peace and security including demonstrations, blockade, and other operations by air, sea, or land forces of members of the UN. The Security Council could, for example, pass a binding resolution that called for member States to enforce a sanctions regime against a particular State. Member States could use the belligerent rights of blockade and visit and search to implement and enforce a UN Security Council Resolution.

RAN STRUCTURE

3

- The Chief of Navy commands the RAN, and is responsible and accountable to the Chief of the Defence Force for its command, leadership and capability.
- The Chief of Navy is responsible for raising, training and sustaining naval forces at levels fit for the required purpose.
- The Chief of Navy has a range of subordinate commanders and organisations with specified functions to assist in carrying out these responsibilities.

RESPONSIBILITIES OF THE CHIEF OF NAVY AND PRINCIPAL SUBORDINATES

The Chief of Navy

The Chief of Navy (CN) commands the RAN and therefore commands all of its uniformed people, regardless of where they work in the Australian Defence Organisation (ADO). CN is responsible to the Chief of the Defence Force (CDF) and the Secretary of the Department of Defence for:

- providing maritime forces that;
    - contribute to the ADF's capability to ensure the defence of Australia and its direct approaches,
    - contribute to the security of Australia's immediate neighbourhood, and
    - support Australia's wider interests.
- raising, training and sustaining naval forces by proper stewardship of human, financial and environmental resources;
- providing timely, accurate and considered advice to the government on strategic direction and military capability of the current force and future force;

- contributing to ADO and government security by supporting strategies to raise security awareness, establish a strong security culture and improve security management; and

- effective risk management and accountability within the Defence governance framework.

CN is also the ADO's principal naval adviser on strategic affairs. CN has a responsibility to provide advice to CDF on current capability, military affairs and future capability development. CN represents the RAN on higher ADO committees including the Defence Committee and the Chiefs of Service Committee.

CN is responsible and accountable to the CDF for command, leadership and the capability output of the RAN, which includes operational performance and whole-of-life management of all Force Element Groups (FEGs). CN is accountable to the Secretary for RAN financial management and for the management of the Navy's civilian staff.

In discharging these responsibilities and accountabilities to CDF and the Secretary, CN also meets many responsibilities and accountabilities to government through the Minister for Defence, the Minister Assisting and the Parliamentary Secretary, as well as various House, Senate and Joint Committees. CN is the principal advisor to government on naval matters and issues or events relating to the command of the RAN. CN is accountable for the accuracy, timeliness and quality of advice provided by Navy to Ministers and government. CN may, therefore, be supported by subordinates in Parliamentary Committees and in the provision of formal advice.

Many of CN's responsibilities are delegated to others within the RAN. CN has three principal subordinates: the Deputy Chief of Navy (DCN), the Maritime Commander (MC), and the Commander Australian Navy Systems Command (CANSC).

The Deputy Chief of Navy

The DCN is the day-to-day capability manager of the RAN and the manager of Navy Headquarters (NHQ). DCN is responsible for the structures and processes for decision making that enable the alignment of accountability, responsibility and performance management within the RAN. FEG Commanders are responsive to DCN in his role as the day-to-day capability manager of the RAN. DCN is also responsible for clearing of formal advice to Ministers and government on day-to-day issues affecting the RAN.

The Australian Commonwealth Naval Board

The Australian Commonwealth Naval Board was the central decision making body for the Australian Navy between 1911 and 1976. The First Naval Member was also titular head of the RAN, the Second Naval Member was responsible for Navy personnel, the Third Naval Member was responsible for ship construction and repair, while the Naval Board Secretary was responsible for Naval administration as the head civilian within Navy. At times the Naval Board was augmented by a Fourth Naval Member (Aviation or Supply depending on need), a Finance member and, during World War Two, a Business Member. Although the Naval Board no longer exists, many of the Naval Board's functions continue to resonate within the current RAN structure.

The Naval Board 17 July 1941

Admiral Colvin welcomes the new First Naval Member Vice Admiral Royle before the other members of the Australian Commonwealth Naval Board

Left to right: R. Anthony (Finance Member), Rear Admiral P. E. McNeil (Third Naval Member), Admiral Sir Ragnar M. Colvin (First Naval Member, retiring), G. L. Macandie (Secretary, Naval Board), Vice Admiral Sir Guy C. C. Royle (First Naval Member), A. R. Nankervis (Secretary, Navy Department), Commodore J. W. Durnford, RN (Second Naval Member), and H. G. Brain (Business Member).

The Maritime Commander

The MC is responsible to the CN for the preparation of naval forces for operations, assigned tasks and contingencies, and for the conduct of maritime operations for the protection of Australia and the promotion of the nation's security and interests. CN has delegated to the MC full command of all operational and support units assigned to Maritime Command.

The MC is also the Maritime Component Commander of Joint Operations Command, and is responsible to the Commander Joint Operations (CJOPS) for the planning and conduct of operations, designated activities and campaigns, and for the execution of the Program of Major Service Activities. The command of operations is discussed in Chapter 4. The MC is also responsible for clearing of formal advice to Ministers and government on day-to-day RAN operational issues.

The Commander Australian Navy Systems Command

The CANSC is responsible to CN for delivering and integrating a range of common services across the RAN, and across some non-Navy Groups. CANSC is responsible to CN for delivering all functions related to:

- Navy personnel and training;
- Navy certification, safety and acceptance;
- command of establishments;
- Navy platforms and weapons systems, including command, control, communications, intelligence and electronic warfare;
- port services; and
- support services such as psychologists, chaplains, and investigators.

The CANSC is also responsible for clearing of formal advice to Ministers and government on day-to-day issues concerning Navy personnel, establishments, systems, safety, certification, acceptance and services.

NAVY ORGANISATIONAL STRUCTURE

Navy Headquarters

NHQ supports the RAN's senior leaders, manages the present RAN, and plans the future RAN. NHQ particularly supports the DCN to effectively conduct the day-to-day business of the RAN. NHQ's roles are to:

- develop strategic level corporate plans, directives and measurement frameworks that will drive RAN capability and preparedness towards the achievement of the RAN's short and long term goals;
- determine RAN policy;
- support the strategic and day-to-day requirements of the CN;
- develop and approve RAN workforce structural requirements (demand) and workforce composition (branch and specialisation structural changes);
- meet Ministerial and parliamentary requirements including the provision of accurate, timely and quality advice to government and Ministers;
- manage issues with the potential to affect the RAN's reputation;
- develop and implement strategies to improve the RAN's internal and external image;
- communicate the RAN's goals and achievements to internal and external audiences;
- liaise with other ADF organisations to align RAN and Defence objectives;
- represent the RAN's interests in the development of Defence policy;
- integrate resources and financial management considerations with the CN's objectives for the preparation of naval forces to meet capability objectives;
- integrate environmental and heritage sustainability principles into command and control structures and planning to minimise risks to the RAN of non-compliance with environmental and heritage legislation; and
- develop and approve RAN plans, budgets and priorities.

Maritime Command

MC delegates authority through three principal subordinates within Maritime Headquarters (MHQ) and seven subordinates located outside MHQ: the Deputy Maritime Commander, Commodore Flotillas, the Chief Combat Support Group, and the seven FEG Commanders.

The Deputy Maritime Commander

The Deputy Maritime Commander is responsible for whole-of-command strategic planning, coordination, business management, performance reporting, legal, reputation and discipline management.

The Commodore Flotillas

The Commodore Flotillas is responsible for force preparation with a primary focus on readiness. A secondary role is to plan and execute force employment when assigned as the Commander of the Deployable Joint Force Headquarters (Maritime).

The Chief Combat Support Group

The Chief Combat Support Group contributes to force preparation with the primary focus on sustainability. The Combat Support Group coordinates the preparation and support of mission capable naval forces and provides associated policy advice.

Force Element Group Commanders

The FEG Commanders are responsible to MC for operational output, and therefore coordinate all aspects of the capability management process. Their focus is on managing the inputs, services and resources needed to deliver capability to the MC for operational use. This is achieved in a framework of cooperative relationships with suppliers and providers. The seven RAN FEGs are:

- Surface Combatant FEG, based in HMAS *Kuttabul*, Sydney, NSW, and with a significant component in Rockingham, WA;
- Amphibious and Afloat Support FEG, based in HMAS *Kuttabul*, Sydney, NSW;
- Submarine FEG, based in HMAS *Stirling*, WA;

- Patrol Boat FEG, based in HMAS *Coonawarra*, Darwin, NT;
- Mine Warfare and Clearance Diving FEG, based in HMAS *Waterhen*, Sydney, NSW;
- Naval Aviation FEG, based in HMAS *Albatross*, Nowra, NSW; and
- Hydrographic, Meteorological and Oceanographic FEG, based in Wollongong, NSW.

Division of Responsibilities within Maritime Command

The relationships between readiness, sustainability, and capability management, and therefore the more detailed responsibilities of Commodore Flotillas, Chief Combat Support Group, and FEG Commanders, are covered in Chapter 7 – *Maritime Preparedness Cycle.*

Navy Systems Command

Navy Systems Command is a large and diverse organisation comprising some 4700 personnel, including permanent and reserve RAN personnel and civilian members of the ADO, with assets across the country. The Headquarters is situated in Canberra and the Command consists of five branches.

Navy Personnel and Training Branch

Navy Personnel and Training Branch is responsible for posting of personnel within the established workforce structures, career management, training, education and personnel development.

Navy Systems Branch

Navy Systems Branch brings together RAN-unique platform, weapon and command, control, communications, computers, intelligence and electronic warfare systems engineering into one organisation. RAN platform and systems engineers possess unique expertise and knowledge not widely available in other areas of the ADF and industry. The Branch mission is to support the cost-effective delivery of naval capability through the provision of integrated technical and operational systems support services and standards. The Director-General Navy Systems is responsible for the command of the RAN Tactical Electronic Warfare Support Section, although this unit is tasked by the MC.

Navy Certification, Safety and Acceptance Agency

Navy Certification, Safety and Acceptance Agency supports the effective delivery of naval and combat capability by FEGs, through oversight and delivery of a regulatory and certification system that ensures the safety, fitness for purpose, materiel and operational integrity of naval capability.

Operations Branch

Operations Branch is responsible for exercising the CANSC's command responsibilities towards regional Naval headquarters, assigned Naval establishments and associated services, and for managing the provision of Port Services, Navy Provost Marshal and Naval Security services. A listing of commissioned and non-commissioned Navy establishments may be found at the end of this chapter.

Business Management Branch

Director Business Management is responsible for the financial management and statutory reporting responsibilities for the Command and for day-to-day management of assigned contracts.

COMMISSIONED ESTABLISHMENTS

DESCRIPTION	NAME	LOCATION
Headquarters / Area administration (Fleet Base East)	HMAS *Kuttabul*	Sydney, NSW
Naval air station	HMAS *Albatross*	Nowra, NSW
Surface ship and Submarine base (Fleet Base West)	HMAS *Stirling*	Garden Island, WA
Patrol boat/Hydrographic ship/ Landing craft base	HMAS *Cairns*	Cairns, QLD
Patrol boat base/Landing craft base	HMAS *Coonawarra*	Darwin, NT
Training establishments	HMAS *Cerberus* HMAS *Creswell* HMAS *Penguin* HMAS *Watson*	Western Port, VIC Jervis Bay, NSW Middle Head, NSW Watsons Bay, NSW
Mine warfare	HMAS *Waterhen*	Sydney, NSW
Communications station / Area administration	HMAS *Harman*	Canberra, ACT

NON-COMMISSIONED ESTABLISHMENTS

FACILITY/UNIT	LOCATION
Jervis Bay Range Facility	Jervis Bay, NSW
Naval Ammunitioning Facility	Eden, NSW
Naval Communications Station	Canberra, ACT
Naval Headquarters South Queensland	Bulimba, QLD
Naval Headquarters South Australia	Keswick, SA
Naval Headquarters Tasmania	Hobart, TAS
West Head Gunnery Range	Flinders, VIC

Commissioned and Non-Commissioned Navy Establishments

COMMAND AND CONTROL

4

- Command and control describes the system that empowers designated commanders to exercise lawful authority and direction over assigned forces for the accomplishment of missions and tasks.
- The command and control infrastructure required to support the ADF needs to be effective in both joint and combined environments.
- Command and control is executed at the strategic, operational and tactical levels.

Command is the legal and organisational authority that gives an individual authority over other members of the RAN. Command brings with it a requirement to control at least part of the activities of other organisations that may or may not be within the commander's chain of command in order to fulfil the mission assigned. Command and control is thus the term used to describe the system that empowers designated commanders to exercise lawful authority and direction over assigned forces for the accomplishment of missions and tasks.

Command in the RAN has traditionally been focused on command at sea. Ships' Commanding Officers were given broad direction from higher command, and then, because of the lack of real-time communications, were able to exercise considerable independence in whatever tactical situation arose. This freedom resulted in the human factor being a force multiplier in the areas of command, morale, and strategic and tactical effectiveness at sea.

Changes over the past decade in the Australian Defence Organisation's (ADO's) organisation and management structure, and in the Australian Defence Force's (ADF's) joint orientation and operational tempo, have not changed the fundamental responsibility of command. Commanders still require sufficient flexibility to enable effective decision-making. They remain individually accountable for their decisions and actions. They have a responsibility to encourage, mentor, discipline, lead and care for those under their command. The challenge is to conduct these command responsibilities in an

environment subject to information overload, under close oversight by political and military superiors, and where tactical decisions may possibly have unforseen strategic consequences.

In general terms, commanders exercise their authority personally through the issue of verbal or written orders, or by the issue of directives or instructions, the detail of which is prepared by their staff, including technical experts. These orders, directives and instructions may be issued electronically, by face-to-face contact, in writing, or by voice communications. The use of computerised command support systems with graphic real-time images is revolutionising the quality and quantity of information available to commanders and the speed with which they are able to direct their subordinates.

The command and control infrastructure now required to support the ADF needs to be effective in both joint and combined environments. It has to be flexible enough to suit the range of tasks that the government requires, and at the same time, it must be adaptable so that each Service can achieve dominance in their own combat environment. RAN command and control arrangements take into account these requirements, and have been strengthened to meet the rapidly changing demands of the complex battlespace of the 21st century.

ADF COMMAND AND CONTROL ARRANGEMENTS

Command in the ADF is based on Commonwealth legislation, and is legally vested in the Chief of the Defence Force (CDF) and the Chief of Navy (CN), the Chief of Army (CA) and the Chief of Air Force (CAF). The legislation permits command to be formally delegated to other officers and members of the ADF. In exercising their authority, commanders draw on information, advice and support from organisations outside their immediate chain of command as a result of the support and structural arrangements that flow from the different powers and responsibilities of the CDF and the Secretary of the Department of Defence. Command and control is executed at the strategic, operational and tactical levels.

Strategic Level of Command

The strategic level is concerned with the employment of national power to secure national objectives. Within the ADF, this level is mainly concerned with the use of military resources to achieve national strategic objectives. CDF commands at this level, assisted by the Service Chiefs who command their own Services, except for those forces required by CDF for operations.

Operational Level of Command

Command at the operational level is concerned with the planning and conduct of ADF campaigns, operations and other activities as directed by CDF. This is the responsibility of the Vice Chief of the Defence Force (VCDF) in the role of the Chief of Joint Operations (CJOPS). CDF's operational command of the ADF is executed through CJOPS. CJOPS exercises theatre command through Strategic Operations Division and Headquarters Joint Operations Command. Other senior commanders may also command at this level for specific campaigns or operations. The CJOPS commands Joint Operations Command in order to plan, control and conduct campaigns, operations, joint exercises, and other activities on behalf of CDF. Joint Operations Command consists of the Headquarters Joint Operations Command, five environmental components (Maritime, Land, Air, Special Operations and Joint Logistics) and a number of direct command units.

Typically CDF will select the level of command and the command arrangements appropriate to the operation. CDF may choose to exercise command through CJOPS to an existing component commander, such as the Maritime Component Commander Joint Operations Command, a Joint Task Force Commander, such as the Commander Northern Command, a Deployable Joint Force Headquarters, or a selected unit commander or individual. The decision will be made based on the desired military-strategic end state, likely forces to be employed, and the desired relationship with other Australian government departments, foreign defence forces, and host government wishes.

Tactical Level of Command

The majority of ADF forces operate at the tactical level where engagements are planned and executed to meet the operational objectives set by CJOPS. RAN ships and units assigned to the operation will typically be formed into a task organisation. A dedicated staff will be formed to support a task group commander and its purview will inevitably straddle the operational and tactical levels.

Assignment of Forces to Operations

When required for combined, joint or specific operations, CDF will direct the Service Chiefs to assign assets to CJOPS. When not assigned, RAN forces are available for training and other tasks as directed by the Maritime Commander (MC). MC will exercise operation command for all units deployed to other countries, unless directed otherwise by CN.

COMMAND WITHIN THE RAN

CDF commands the ADF, which has adopted a joint approach to most of its activities. Nevertheless, there is widespread recognition that the RAN, Australian Army and Royal Australian Air Force (RAAF) must maintain professional mastery in their own combat environments in order to contribute effectively in joint operations. RAN personnel may exercise command in both joint and RAN environments, and may be commanded by Army and RAAF personnel in a joint environment.

Every member of the Navy has the potential to exercise command by virtue either of the rank they hold or the nature of the appointment they fill. The nature and scope of authority varies from appointment to appointment and increases with rank. The command of task groups, ships, submarines, aircraft squadrons and Clearance Diving Teams (CDTs) can only be exercised by those possessing the specialist qualifications to do so. Authority derived from an appointment is specific in nature, and is related to the responsibilities of a particular posting. Authority due to rank is accorded to each member of the ADF based on their status within the rank structure of their Service and the level of responsibility appointed to particular positions within the organisation. The more senior officers in roles requiring them to exercise command over large numbers of personnel are customarily called 'commanders' but, strictly speaking, the term can be applied to any member of the RAN exercising military authority over his or her subordinates. Command is vested in the officer posted in command by CN.

The definition of command makes it clear that there is a strong inherent sense of individual responsibility and accountability. It is the commander who must be prepared to lead, make decisions, encourage, mentor, discipline, direct, control and care for those under his or her command and be accountable for their actions. There is also an implicit obligation on the RAN to ensure that commanders are adequately prepared for the task through prior career management to equip them with the education, training and experience to succeed.

Task Group Command

Commodore Flotillas

Commodore Flotillas (COMFLOT) is responsible to the MC for attaining and then maintaining fleet operational standards and a constantly ready command task group for operational contingencies.

Deployable Joint Force Headquarters (Maritime)

The Deployable Joint Force Headquarters (Maritime) (DJFHQ (M)) is responsible for the planning, conduct and command of operations at the tactical level of warfare as directed by the Deputy Commander Joint Operations Command or the MC. DJFHQ (M) will form a component of the staff of a combined or joint task force or lower level task group or task unit command staff. COMFLOT heads this group as Commander DJFHQ (M).

Role of the Task Group Commander

The Task Group Commander (CTG) deals with a broad range of issues ranging from the operational, and at times even strategic, to the tactical level. Perhaps the greatest challenge, given this breadth of responsibility, is creating a clear chain of command with effective information support. At a basic level the CTG is generally appointed for a specific mission and is equipped to effectively maintain command of that mission for extended periods.

The CTG will have responsibilities to work-up assigned ships for a particular operation or exercise and, as the senior officer, will have responsibility for the performance of assigned units. The CTG will have a similar relationship with the MC as other Commanding Officers, and the Commanding Officers of assigned units will work through the CTG for many issues.

Tactical Warfare Commanders

In recent years there has been recognition of the need for a properly constituted task group command structure. RAN Tactical Warfare Commanders (TWC) were designated in 2001 to command the surface combatant, amphibious warfare, submarine, and mine warfare and Clearance Diving task groups. In a remarkably short time the concept has demonstrated its utility across the spectrum of operations. The TWC focus is the planning, execution and command of operations. This involves a range of tactical, operational and sometimes strategic issues.

TWC responsibilities fall into three areas:

- The planning and conduct of operations and command of assigned units within a combined, joint or maritime task force, either as part of the DJFHQ(M) or as an embarked Task Group Commander;
- The promotion of the operational effectiveness of the task group and supporting units through measures to develop and maintain appropriate levels of expertise and preparedness for task group operations in the maritime environment; and
- The provision of mentoring and advice to personnel within the task group.

Unit Command

The CN personally appoints each Commanding Officer of RAN ships and units, at sea and ashore. The vital command responsibilities of preparedness and human resource management remain common to both forms of command and are a key part of the RAN's command and control.

Sea Command

Command at sea, which includes helicopter squadron and CDT command, represents the most significant early test for naval officers who aspire to command at every level. It is a valuable and effective test, which assists in identifying those who have potential to achieve command success in higher level positions.

In recent years, the impact of technology has increased the complexity of the RAN's operating environment. Many of the fundamental leadership and personnel management challenges of command have been reinforced by the introduction of strong legislative penalties for breaches of requirements in areas such as occupational health and safety, and equity and diversity. Notwithstanding these changes, the essential nature of

command at sea has not changed; it is still strongly tactical in nature and the impact of most decisions will be felt in the short term. The position of the Commanding Officer at the pinnacle of a small hierarchy is unchanged and instant obedience to a command decision is still necessary and expected.

A sea command appointment is not a training role. Officers posted to sea command must be competent commanders in the broadest possible sense before they take up their appointment.

Command Ashore

RAN shore establishments exist primarily to develop, manage, maintain and sustain the infrastructure and services necessary to project and support operational capability through the subordinate and lodger units located within them. However, these units and their military personnel are not necessarily within the Commanding Officer's direct chain of command and are often not part of the RAN. Commanding Officers ashore are responsible for coordinating all cross-establishment administrative, logistics and other services, including safety, and this involves coordinating activities between the subordinate and lodger units as well as close engagement of the appropriate enabling groups and output groups within the ADO and a wide range of external organisations.

Shore establishments no longer have embedded ships' companies equivalent to the command hierarchy at sea. Much of the work formerly done ashore by members of the RAN is now done by civilians – in the public and the private sectors - over whom an establishment Commanding Officer has no military authority. While Commanding Officers ashore remain responsible for the discipline, health, welfare, and morale of all military personnel posted to their command, many of these personnel are now employed in other Defence Groups, and in locations distant from the establishment.

While the leadership and management environment in a commercialised establishment ashore is very different from the operational environment of a seagoing command, many of the fundamental obligations of command remain unchanged. However, a great majority of the shore Commanding Officer's responsibilities focus on business and management issues, and some of the prerequisite skills and training required to effectively command ashore now differ considerably from the sea-going environment.

THE FUTURE COMMAND ENVIRONMENT

The ADF's adoption of network centric warfare (NCW) is driving the RAN's command and control future. Future technologies, particularly advances in information technology, will enable a more distributed command structure for the ADF, but it is critical to

remember that command is, and will always remain, a human function. Technology can be expected to change the way in which command is exercised, but the fundamentals will remain constant. We can also expect to see a greater distinction between the concepts of command and control, with command functions being centralised, but control functions being distributed to the lowest reasonable level. The concept of mission command will become the norm across all ADF operations. This concept is not new to navies, due to the inadequate or at least untimely communications technology of the past. It is consistent with the way command at sea has always been exercised, but may well impact on the command and control arrangements of joint operations. Decentralised control of operations will remain the key to ensuring the RAN remains a resourceful, innovative, flexible and adaptable component of the joint seamless force.

Mission Command

Vice Admiral Horatio Nelson, RN (1758-1805), widely regarded as one of the greatest fighting admirals in history, was also a charismatic leader and dynamic commander, who famously anticipated the advent of mission command.

Technology will increasingly allow commanders to monitor the progress of their subordinates, but they must avoid the temptation to intervene just because they can. That said, the same technology that allows commanders real-time information on their subordinates' actions has already caused a reduction in the traditional boundaries between strategic, operational and tactical actions. Consequently, there may well be justification for commanders to intervene in a traditionally tactical action where, because of access to superior information, it becomes apparent that an adverse strategic outcome may result without their intervention. Commanders at all levels must be mindful of this and accept this intervention from above, but equally ensure that such intervention is not unnecessarily imposed on their subordinates.

Another important consideration in future command and control arrangements is information management. Technology will provide the means of transferring large quantities of information, but more information does not necessarily lead to better understanding. In fact, information overload is a very real possibility, and management procedures must ensure that only necessary information is passed around the network. This will be the single greatest challenge in evolving future command and control arrangements.

PERSONNEL

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- Despite advances in technology, people are the most important factor in generating the RAN's capability.
- In order to maintain the correct size, shape and skill balance of its workforce, the RAN matches workforce supply and demand, provides through-career training and education, and seeks to develop appropriate strategies to attract and retain the right number of people in the right mix of specialisations.

The heart of the RAN's capability is its people. Even with the continuing drive towards minimum-crewed ships, automated weapons systems, and uninhabited vehicles, it is impossible to see a future RAN where men and women do not play a central role. As powerful as a warship may appear alongside the wharf, the quality of the crew dictates the effectiveness of the unit and the level of capability it can deliver.

It is not sufficient for the RAN to have all of its organisational positions filled. If the RAN is to deliver the capability required by the government, each and every member needs to have the appropriate skills and knowledge to perform proficiently in their position. The RAN relies on each member performing competently in a team. In the past, where these skills and knowledge have been shown to be deficient, results have often been disastrous.

Equally as important as the required skills and knowledge are the values, beliefs and attitudes of members. RAN personnel require the appropriate attitudes and values to carry out their duties in a professional manner. Without appropriate values instilled and inculcated within their teams, commanders would not be able to rely on their subordinates to carry out their intent in the likely absence of direct control.

A well-trained and ethical force needs to be sustained, across the spectrum of operations. The RAN attempts to create a work environment to which people want to belong; one that caters for diversity, provides security, challenge, balance and a sense of doing something important. The RAN actively sustains its workforce not only with worthwhile employment but also with healthcare, housing, moral guidance and social support.

The mistaking of a rope, by an unskilful person, either in a fight or upon a lee shore, may be the loss of all.

Author unknown, circa 1619
Reasons against the Proposition of Lessening the Number of Men Aboard the King's Ships

In order to create this well trained and ethical force, the Chief of Navy is responsible for the raising, training and sustaining of the RAN workforce.

RAISING THE RAN WORKFORCE

The extent to which the workforce is sized and structured correctly is fundamental to how prepared the RAN is to meet the capability requirements of the government. To raise an effective and appropriately shaped force, the RAN must balance workforce demand and workforce supply.

Workforce Demand

Workforce demand defines the numbers of people and their competencies necessary for the RAN to deliver the capability requirements expected by the government. Those capabilities are articulated in policy documents such as *Defence 2000: Our Future Defence Force* and Defence capability plans.

The current workforce - that is, the current mix of its size, shape, cost, location and capability - supports the RAN's wider capability demands. However, future planning and strategy changes have significant potential to shift the demand for the workforce. The most likely direct drivers of this change are:

- changes to current and future force structure;
- changes in preparedness levels; and
- alterations to human resource policy, legislation, technology or resources.

The RAN's current workforce demand comprises the number of trained personnel required to deliver capability (made up of the number of positions currently established), an allowance for personnel undertaking training, and a number of positions to allow for

personnel on extended leave. Trained personnel are drawn from both the permanent and reserve forces within the RAN.

Workforce Supply

Workforce supply denotes the number of personnel the RAN has available to carry out its functions. Workforce supply is the result of managing the interdependencies between the recruiting, training, professional development and qualification continuums, balanced against financial constraints. This results in two main areas of activity:

- **Attraction** – focused on the potential RAN workforce of the future, comprising demographic profiles of the national labour market and associated trends, as well as marketing and recruitment capabilities within Defence.

- **Retention** – focused on the RAN workforce of today and the ability to keep that workforce in its employ.

The RAN competes with the Australian Army and the RAAF, as well as the broader job market, for quality applicants. The Australian labour market is facing shortages in technical trades, a declining birth rate, an ageing population, and a strong economy. Accordingly, competition for applicants is, and will remain, fierce.

Balancing Supply and Demand

Balancing workforce supply and demand is the first step in the workforce planning and management process. The RAN manages the transition of personnel from initial entry through to their exit from the Service via the following processes:

- providing new recruiting strategies to aid attraction;
- providing initial training;
- providing individual employment specific training;
- providing individual trade, position, platform and advanced training;
- providing leadership, management and personal development training and ongoing career management;
- developing and delivering strategies to aid retention;
- altering the size and shape of workforce supply through re-entry, transfer to the RAN Reserve force, separation, and extensions of service; and
- developing and providing career transition advice and assistance.

TRAINING RAN PERSONNEL

The RAN's ability to fight and win at sea is directly dependent on the skills and capabilities of its people. The RAN must produce personnel who are capable of supporting themselves, their unit and their equipment in potentially extreme or hostile environments for long periods of time. Training is a continuous through-career process, due to changes in doctrine, tactics and equipment. Most RAN personnel are in the position of training others, and of being trained themselves, regardless of whether they are working in a formal training environment or not.

Development of Competencies

The RAN employs a phased approach to training to ensure complete skill and knowledge development:

- The first phase involves analysing the job to be performed in the environment where it will be performed, and breaking that job down to its smallest learnable tasks;

- The next three phases involve the design, development, and conduct of all training interventions. Training can take the form of classroom instruction, simulation, electronic learning or on-the-job instruction. Where possible, assessment is undertaken on-the-job, or in as close a depiction of the job environment as is feasible; and

- The final phase of validation ensures that the skills and knowledge demonstrated in the classroom or simulator match the job and the workplace, to ensure the currency and appropriateness of training.

Development of Values and Attitudes

Careful recruiting strategies include criteria that focus not only on aptitude but also on the fit between the applicant's attitudes, values and personality and the RAN's values and ethos. The RAN then inculcates appropriate values and behaviour (to influence attitudes) through modelling and delivering practical values-based training. Staff at initial training establishments are expected to be living examples of Navy's values for the trainees. These values guide how RAN members will behave, how they will treat each other and define what is important to each member throughout their time in the RAN.

Navy's Values

Honour – the fundamental value on which the Navy's and each person's reputation depends. To demonstrate honour demands honesty, courage, integrity and loyalty, and to consistently behave in a way that is becoming and worthwhile.

Honesty – always being truthful, knowing and doing what is right for the Navy and ourselves.

Courage – the strength of character to do what is right in the face of personal adversity, danger or threat.

Loyalty – being committed to each other and to our duty of service to Australia.

Integrity – the display of truth, honesty and fairness that gains respect and trust from others.

Initial Entry Training

RAN initial entry training aims to:

- **Develop self-discipline** through the conduct of physically and mentally challenging training. In order to develop the basis for leadership and close teamwork, the RAN ensures that initial training, both officer and sailor, is conducted within a military environment with a high percentage of uniformed presence. All members of the RAN are subject to the *Defence Force Discipline Act 1982*, which places additional legally enforceable behaviour restrictions on members of the ADF. However, discipline at the Recruit School, the Royal Australian Naval College, and the Australian Defence Force Academy refers more to self-discipline than the externally imposed discipline defined in the Act. Self-discipline is about organisational conformity with individuals' aspirations towards common goals.

- **Introduce members to the maritime environment** through the use of shared accommodation and communal living in initial training establishments, and exposure to all facets of life at sea through periods of training and experience on RAN vessels.

- **Inculcate Navy values and ethos**. Our ethos is defined simply as 'regard for the values, traditions and practices of the RAN'. In its mature form, our ethos generates loyalty and is a major component of the motivation to serve. In initial entry training, an appreciation of RAN ethos is imbued most profoundly by the example of the military staff and the shared experience of communal living and life at sea. In a formal sense, ethos is fostered by formal lessons, which deconstruct leadership, ethics and values. All training is values-based, that is to say that all lessons relate back to the RAN's values. Course training aims are not merely the technical elements of lessons but incorporate the need for ethical actions/behaviours on the part of all trainees in all circumstances.

Leadership and Management Training

Leadership and management training starts on entry, and is revised, refined and developed throughout a members career by way of targeted mandatory courses. The proportion of leadership and management training delivered is commensurate with the requirement at each broad career level for officers and sailors.

Leadership and management training is delivered in a variety of ways including classroom theory, case studies of famous leaders, simulation, and practical hands-on experience and coaching.

The preparation of officers for command of an operational unit involves through-career training and experience. Specific training is also provided once an officer is selected for a command position. This training involves the provision of a framework upon which to base the member's mental preparation, an insight into the practical aspects of command at sea and formal opportunities during the course to ensure the member has the necessary current competencies to command their unit.

Individual Training

Individual training is defined as employment, professional, equipment and/or platform-specific training that is required for personnel to become effective members of an operational unit. More specifically, it is the training required to successfully fulfil a defined position within the RAN workforce, as well as the ongoing professional training required to meet the obligations associated with increasing rank. Individual training is delivered in the following broad skill sets:

- **Maritime Warfare**. This skill set includes seamanship, navigation, communications and information systems, warfare systems, gunnery, combat survivability, hydrographic, diving, mine warfare, intelligence, and physical training.

- **Logistics**. This skill set includes engineering, technical, supply, and health training. Considering the complexity and diversity of maritime propulsion and weapon systems, the training of competent maintainers, capable of repairing machinery at sea, is a long and intensive process.

- **Aviation**. This skill set includes all aspects of aviation and aviation related training.

- **Submarine**. This skill set includes all facets of submarine training beginning with an assessment of suitability for employment in submarines.

- **Initial Training, Leadership and Management**. This skill set includes all initial training, and career leadership and management training for personnel up to the rank of Lieutenant Commander, including the development and management of policies that cover: officer and sailor leadership, management and personal development, sail training, alcohol and drug awareness, equity and diversity, critical incident stress management and occupational health and safety training.

Team and Collective Training

Creating team cohesion and developing harmonious, effective crews is a two-fold process. As a unit completes an extended maintenance or leave period and a new crew is formed, the crew will undergo simulated or classroom team training, then undergo practical training and assessment at sea. The RAN's Sea Training Group will ultimately assess that unit's ability to deliver operational capability during an operational readiness evaluation at the end of the work up cycle. As ships often deploy as task groups, collective training brings together all elements of a task group to ensure they can operate effectively together. Collective training can be conducted ashore using simulators or by ships alongside using integrated on-board training systems networked with the shore based simulators. Collective training can also involve coalition forces through the use of distributed interactive simulation.

Ship's Safety and Survivability Training

Every member of the RAN undergoes ship safety and survivability training during initial entry training and throughout their career to maintain competency and currency. This training provides individuals with the skills to survive accidental or battle damage to their ships. Advanced training prepares individuals to lead and supervise other members in the conduct of ship's safety and survivability activities. The skill sets instructed during this training are considered essential to the operational effectiveness of the RAN. Surviving battle damage and fighting back has always been a core tenet of warfighting in the maritime environment.

Education

The RAN offers members a variety of opportunities to extend their educational qualifications, through specific employment category professional development programs, and access to wider Defence education initiatives.

To build confidence, self-esteem, and to lay the foundations for eventual transition into the community, the RAN not only delivers accredited education but also supports civilian education that is of mutual long-term benefit to members and the organisation.

> Skill in naval affairs, as in other crafts, is the result of scientific training. It is impossible to acquire the skill unless the matter be treated as of the first importance and all other pursuits are considered to be secondary to it.
>
> Thucydides, Athenian General and Historian
> *History of the Peloponnesian Wars*, c. 404 BCE

SUSTAINING RAN PERSONNEL

In order to sustain its workforce the RAN must attract and retain the right number of people of the right mix of employment categories. Attraction is a function of the recruiting process where jobs and careers are marketed, but can also focus on transfer from the Army or RAAF, lateral recruiting from homogenous industries, or strategies to regain former members.

Retention

Although the RAN expends great effort in attracting and training the right people, great effort is also made to retain them. Retaining skilled people is the most efficient way to realise the long-term investment in training and development of the RAN's personnel to meet the increasing demands of operational commitments. Individuals serving for longer periods continue to gain important skills, attributes and experience, which in turn enables the RAN to operate at higher levels of professional performance and reduces the load on the recruiting and training systems.

A certain amount of turnover of personnel is healthy for the organisation. Maintaining an acceptable rate of separation of people from the RAN allows for the movement and promotion of individuals in a way that provides people with tangible growth opportunities that can be attained in a reasonable time frame. From an organisational viewpoint, it also prevents workforce stagnation and the development of excessively rigid organisational mindsets. A major workforce management challenge is to maintain an appropriate balance between separation and retention.

The reasons people leave the RAN are influenced by a complex combination of factors, both personal and environmental. The most common factors affecting departure include length of service, age, gender, marital status and the economic climate.

Average separation rates have remained reasonably stable over the last few years; however, some employment categories have experienced high separation rates and

have become unsustainable in the short to medium term. These groups are termed critical and have insufficient numbers or experience to meet either their current or future capability outcomes. Specific recruiting activities and retention initiatives are focussed on these groups. Categories become critical through a number of reasons including high separation rates, poor recruiting outcomes and trade reviews and restructures. These categories tend to be specialist groups where competition for these skills is high across Australian industry, and more attractive employment options can be negotiated. The challenge for the RAN is to be considered an employer of choice, and to adopt a range of flexible and attractive employment arrangements to suit the expectations of a scarce recruiting resource.

Workforce Management Strategies

The RAN has a range of strategies and levers available to try and influence retention of the right number and mix of people:

- **Careers**. Attractive career options help retain people beyond their initial commitment. The RAN aims to employ its members in jobs that are matched to their skills, experience and potential for development. Effective personnel and career management is about providing individuals with options and some control over their careers. This involves matching a person's skills, experience and desires with organisational needs, providing a structured sequence of developmental and training experiences for individuals that accord with their broad aspirations within a consistent career development framework.

- **Training, Education and Professional Development**. Without a long-term vision and sufficient investment in higher education for RAN personnel, some employment categories may find themselves marginalised professionally in comparison with their civilian counterparts. Investment in training and education is an important retention measure and benefits the organisation in terms of improved performance, preparation for higher rank positions, maintenance of current effectiveness, and facilitating morale. Training in the RAN is a through-career process, coupled with appropriate civilian accreditation and processes for recognition of prior knowledge and experience. Most employment categories have developed, or are in the process of developing, professional continuums for their people, to ensure they are current and relevant in their skills.

- **Financial and Non-Financial Conditions of Service**. The RAN and the wider Defence organisation have in place a range of financial and non-financial incentives for employment in certain categories and on certain tasks to attract and retain members. These conditions of service also aim to compensate for long hours, high mobility, arduous conditions and the retention of critical skills. They can include subsidised

housing, spouse support, retention bonuses and targeted allowances. The RAN continues to look closely at the conditions for employment categories to ensure relevance in the wider community, and to compensate for the particular nature of naval service.

- **Work/Life Balance**. Every member of the RAN has a commitment to serve at sea. Sea service places RAN personnel in an environment that is stressful, tiring and removed from family, friends and many of the comforts and activities of normal life. The RAN attempts to achieve a balance between work commitments and other elements of a person's life to ensure our people 'live well, work well and be well'. This balance is aided through recognition of family commitments and the establishment of flexible working arrangements and cycles of employment designed to ensure that every member has an opportunity to have a break from extended periods at sea or sustained operations. Flexible employment options contribute to improved morale, motivation, job satisfaction and ultimately retention. Other employment strategies that contribute to a healthy balance include part-time arrangements, flexible hours, a range of leave options and education opportunities.

- **Reward and Recognition**. Reward and recognition for a job well done is an important facet of retaining the right people. A number of methods are used to reward and recognise long, loyal and exceptional service in the RAN and wider Defence community. Official processes are mandated for a range of Australian honours and awards, and RAN or ADF commendations, and commanders are encouraged to consider closely the application of these to their personnel. Internal visual and informal reward and recognition processes are encouraged and utilised, such as recognition of readiness to be deployed on operations at sea and ashore or in support of such operations through the Service Readiness Badge. Other tangible methods of recognition include promotion and selective employment.

- **Selective Redundancies**. As some employment or skill groups become obsolete, the RAN can use forms of redundancy to reduce the workforce demand and shape supply

Historically, the best-trained and led sailors have invariably won the war at sea, and the maritime war of the future is unlikely to be significantly different.

Captain Peter Jones, AM, RAN
The Face of Naval Battle, 2003

MARITIME LOGISTICS

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- Maritime logistics ensures combat forces operating at sea and in the littoral region can be sustained to meet their operational requirements.
- Maritime logistic support principles apply across fleet, ship classes and platforms to ensure that ships and units can work together in task groups when required.
- Logistic support is essential to providing vital attributes of maritime force employment, such as reach, agility and flexibility.

Maritime logistic support has developed over the centuries in response to the needs of combat forces in the maritime environment. Maritime logistic support in the RAN context is an extension of the Australian Defence Force (ADF) logistics system into the maritime environment. Logistic support for maritime forces is drawn primarily from Australia, our national support base. To this end, logistics is defined as 'the science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, it comprises those aspects of military operations which deal with:

- design and development, acquisition, storage, movement, distribution, maintenance, evacuation and disposition of materiel;
- transport of personnel;
- acquisition or construction, maintenance, operation, and disposition of facilities;
- acquisition or furnishing of service; and
- medical and health service support'.

Logistics is critical to the preparation, work-up, operational employment and reconstitution of maritime capability. The two dimensions to logistics are:

- **Capability support**, which is the acquisition, generation, management and sustainment of a capability from inception to disposal. These activities are typically

performed in the national support base, and are aimed at supporting capability to meet the requirements of Australia's defence policy.

- **Operations support**, which is focused on the delivery of support to sustain a specific operation. Operational maritime logistics delivers replenishment, maintenance and support to personnel, including health, administration and financial arrangements. The means and methods developed to deliver this support are tailored to overcome the limitations of the maritime environment. Some of these limitations include ship design and logistic capacity, characteristics of the transit route to the operational area, physical, geographic and oceanographic characteristics of the operational area, and support services available to Australian forces in the operational area.

MARITIME LOGISTIC SUPPORT CONSIDERATIONS

Design and Maintenance Limitations

Many constraints on logistic support in the maritime environment are set long before the unit is deployed on operations. The design of the ship, its operational concept, and the logistic support concept, including spares for its whole life, limit the time the ship can remain at sea. Ships have finite storage capacity as well as weight, volume and stability constraints. These characteristics are very difficult and expensive to change once the ship is built. For example, the size of storerooms constrains the amount of food and spares the ship can carry and thus the amount of time a ship can operate independently without replenishment support. These storerooms are difficult to enlarge after construction. In order to ensure that the ship can be supported for its required employment, these factors must be considered during the design phase.

Replenishment at sea (RAS) requirements are a major consideration in warship design. These factors include internal replenishment routes, liquid transfer and management systems, and materiel handling equipment. The design also needs to be compatible with replenishment systems of potential allies and coalition partners, and to incorporate measures to prevent environmental pollution. In the case of warships, there is also the requirement to operate weapons and sensors while undertaking replenishment. When these factors are not given due consideration, the ship requires time away from its tasking to replenish, either in port or at sea.

Ships are maintained according to their usage upkeep plan, which is developed before the ship is built. This plan is managed so the ship and its systems are regularly maintained. This ensures the ship is available to conduct a range of operations, for the maximum amount of time, within the maintenance requirements. Both operations and capability support contribute to achieving this. The ship cannot be ready for deployment,

or sustained for a specific mission, without the capability support activities performed throughout the ship's life. Typically, deep level support is drawn from Australia, sourced from Australian industry, international agreements and strategic contracts.

It has been well said that Nelson took more care of his topgallant masts, in ordinary cruising, than he did of his whole fleet when the enemy was to be checked or beaten.

Alfred Thayer Mahan
Lessons of the War with Spain, 1899

Domestic and International Considerations

Domestic and international economic policy, industry capacity, and the prevailing political climate are all factors that determine how an operation or activity will be supported. This affects ship operations, both within Australia and overseas.

Ships regularly deploy away from their homeport, regardless of whether they are conducting routine peacetime activities or undertaking combat operations. There is a cost premium associated with conducting activities, particularly in remote ports which do not have the range of local infrastructure required to support a ship. In Australian ports with heavy shipping traffic, securing of berthing space and port services may also be difficult and costly. For example, commercial shipping routes determine the transit times for materiel, accessibility to major ports for repair, maintenance and resupply, the infrastructure and services available in the port, and availability of goods and services required.

Logistic support to a warship outside Australian waters is subject to international economic influences as much as any other commercial enterprise. Market competition, supply and demand, interest rates and price fluctuations all affect support to ships, because they consume goods and services in the global economy. For example, obtaining a berth in an industrial port at short notice is uncertain because commercial shipping generates income for the port authority, and supports international trade, which is important for that country's economy. A warship occupying a commercial shipping berth does not generate steady income for the port. It interrupts trade patterns and does not directly support import or export activity. A warship, due to its much larger crew, also needs access to larger volumes of food, which may be beyond the capacity of the local economy to supply. Repair parts, meeting Australian standards, may be obtained overseas, but this can be at a cost premium. In addition to physical

and environmental factors, in a conflict situation, force protection is a governing consideration in logistic support. Assets, vital supplies and civilian contractors must be protected and this requirement features prominently in logistic planning.

Environmental Factors

Sea state, tidal patterns, geography, wind and weather affect a ship's employment. These factors make logistic support to an operation challenging, so sound planning, including for contingency, is essential. For example, it is unsafe to conduct replenishment at sea in extreme weather, so the ship needs to retain sufficient reserve capacity of fuel, stores, ammunition and victuals to continue operations until the evolution can be rescheduled or moved to another location with suitable weather conditions.

Australian National Obligations

Australia regulates matters of quarantine, health and safety, environment protection, maintenance, trade practices and industry standards. Protecting the marine environment is a major requirement and shapes maritime logistics. Recent international agreements governing double-hulled tankers, garbage disposal standards and oily waste and sewerage disposal, influence the way the RAN operates. For example, when returning equipment to Australia from overseas, very high quarantine standards must be met to prevent the spread of disease or pests into Australia that might threaten primary industry. This means that it takes longer to return equipment for maintenance, which, given the limited quantities of equipment, influences the provision of assets for continued operations or training purposes.

There must be great care taken to send us munition and victual whithersoever the enemy goeth.

Francis Drake: To Walsyngham
During the operations against the Armada, 1588

NAVY OPERATIONAL LOGISTIC SUPPORT CONCEPTS

Self-Sufficiency

Ships operate individually or in task groups, and are required to be logistically self-sufficient for the initial periods of a deployment. In addition, ships may have to

operate independently of continuous resupply channels, and often without continuous communication links with external supply support infrastructure.

The amount of support carried is based on the endurance expected of the ship and the size of the ship. Endurance is the amount of time a ship can stay at sea before resupply is required. Endurance can vary due to consumption rates and resupply available. RAN platforms range in size from minor war vessels to major fleet units, but all platforms need the same range of support services to function effectively: food, water, fuel, sewerage and rubbish disposal, personnel support, spare parts, and maintenance. Some ships require a greater degree of external assistance than others. Accordingly, the RAN operates its units under different support concepts dependent upon the size and logistics capacity of the unit:

- **Major fleet units**. These ships are designed to operate independently in most navigable areas of the world's oceans. They can operate for extended periods at sea by replenishing supplies, including fuel, water, provisions and ammunition while underway. Their internal logistic support capacity enables them to react to changes in mission because they have specialist personnel, access to resources, some onboard maintenance capability, and can operate independently of a parent base.

- **Minor war vessels**. Smaller vessels are designed to operate autonomously for much shorter periods. Their tasking is usually regional due to their requirement for support from their parent establishment or ship, but occasionally they deploy remotely, including to foreign ports. Their logistic support is limited by the space available for provisions and repair parts. They usually do not have dedicated logistics personnel embarked and their support is organised and provided by the staff of the parent establishment. Examples of such vessels include patrol boats, landing craft and mine warfare craft. Clearance Diving Teams (CDTs), helicopter detachments and special forces elements are supported in a similar way.

- **Coastal and harbour craft**. These vessels are designed for work in and around the harbour environment and therefore rely heavily on shore based support. They have minimal, if any, self-sufficient logistics capability.

Replenishment at Sea

The provision of supplies through underway replenishment ships and the ability to resupply at sea enables fighting units to remain on station for prolonged periods. RAS is a significant force multiplier that extends the range and sustainment of the ship. Afloat support ships provide greater reach and endurance and allow self-reliant and sustained operations to be conducted further away from shore based support. This support may be called upon routinely or as required during operations. The flexibility provided

by this concept is particularly important when host nation or contractor support may be insufficient or unavailable. This may be due to remoteness of location, conflict and instability, or diplomatic considerations. The operational role of a maritime unit will be constrained by the ability of the logistic network to provide support to the unit on task. Warships will normally operate in task groups for reasons of operational flexibility, mutual support and to increase redundancy and support options for the Commanding Officer.

Replenishment Ships

These ships are specifically designed to support other ships with limited self-sustainment capacity. They carry, and have the ability to deliver provisions and general stores, and they deliver and receive fuel. As a rule, the RAN's replenishment ships do not maintain stocks of repair or spare parts, however, HMAS *Success* has the capacity to do so if necessary. These ships deliver logistic support, which extends the amount of time major fleet units or task groups can remain at sea beyond their initial endurance limit.

Amphibious Ships

These ships are designed to embark land forces and their equipment, and have an inherent, albeit limited, capacity to sustain land operations. These ships typically have a large radius of action, materiel-handling equipment to embark and disembark troops, and some capacity to support other ships, notably surface combatants. They also have considerable capacity to transport stores and equipment to support operations.

Contract Support

The RAN has established a standing offer for the provision of Port Agency services from Australian industry. This standing offer extends to parts of Asia and the Pacific, providing a high degree of preparedness should the ADF need to conduct operations in or near any part of Australia's neighbourhood. These arrangements are used routinely, and can be activated at short notice if necessary, to support the spectrum of ADF operations. These arrangements enable flexible, responsive support to ships, and if necessary, other ADF units.

Logistic Support Elements

The RAN has developed and implemented the concept of forward-deployed logistic support elements (LSE). Usually the LSE will only be established in a theatre of operations. The LSE will generally comprise a small group of supply and technical personnel whose mission is to source and coordinate the delivery of spare parts, provisions and general support to maritime units. The LSE also acts as the interface between ships and shore support infrastructure. The LSE facilitates diplomatic clearances, customs and quarantine compliance, and contractual arrangements for support. If operating in a multinational environment, the LSE will also facilitate any host nation or allied agreements for support.

Allied Support

Support from other nations cannot always be guaranteed, however the ADF has international agreements with allies to provide mutual logistic support as required. The RAN capitalises on commonality of systems, logistic data and common operating procedures to access this support. The RAN remains interoperable with potential partners by investing in common hardware and exercising procedures such as RAS and standard tactics at sea with other navies. Another way to co-operate is to use common contracts with allies for supply of provisions and port services.

HMAS *Vendetta* in Vietnam

From September 1969 to April 1970 the *Daring* class destroyer HMAS *Vendetta* served in Vietnam during a gap in availability of the *Perth* class guided missile destroyers. Possessing six 4.5" guns capable of a theoretical maximum rate of fire of 60 rounds per minute, the ship was particularly well suited to the naval gunfire support role. However, the British designed *Vendetta* was less easily supported by the USN logistic train than the American built *Perth* class ships – ammunition, replacement gun barrels and equipment spares for *Vendetta* had to be pre-positioned in the Philippines. As a result, and despite being no less successful than the *Perth* class at providing fire support, the RAN only completed one *Daring* class destroyer deployment to Vietnam, compared to three each for HMAS *Hobart (II)* and HMAS *Perth (II)* and two for HMAS *Brisbane (II)*.

KEY THEMES AND PRINCIPLES

Planning and Preparedness

Planning is a key requirement of maritime logistics support. The usage upkeep plan previously mentioned governs the availability of the ship for operations. Planning for operations should tie in with this cycle when calculating quantities of provisions and spare parts. Ships generally sail stored to capacity, for maximum flexibility in case the ship is assigned to a different task at short notice. Storing considerations include length of mission, space available, safe storage - for example fuel and ammunition cannot be stored together, in case of explosion - and weight and volume of items. Stock rotation and shelf life of perishable stores must also be taken into consideration.

Ships carry spare parts for both preventive maintenance and corrective maintenance. Mission critical systems also require insurance spare parts to repair random catastrophic failure away from shore support facilities. Spare and replacement parts allowances are continually reviewed and adjusted based on actual usage to maintain the required probability of mission success. This requires detailed monitoring of item usage, platform configuration, system usage and performance.

The RAN employs logistics information management systems in ships and ashore. Onboard ships, all maintenance and inventory data required to conduct organic maintenance is available in an integrated logistic support (ILS) system. This system can operate in isolation and interact with shore based logistic information systems to communicate maintenance and supply data. The ability to communicate with the ADF

supply system, to access spare parts and maintenance data is central to the effectiveness of support to ships. This ability links to the requirement to communicate and integrate with allies for reasons of mutual support. The RAN uses the NATO standard codification conventions for parts and systems. This enables sharing of information and acquisition of parts from countries that use this system, such as the UK and the US.

Maintenance

Technical Regulation

The RAN has a naval technical regulatory system (NTRS) that provides assurance of the technical integrity of ships. The purpose of having a system to regulate changes to ships is to provide documented processes to mitigate and manage risk when ship design, maintenance and operation need to be changed from the original concept.

The NTRS is based on the philosophy that every engineering decision involves risk. Technical regulation is a principles-based system for controlling risk during design, construction and maintenance of ADF maritime materiel that affects fitness for service, safety and environmental compliance. The NTRS utilises a risk-based approach when maintaining the technical integrity of ADF maritime materiel. To comply with NTRS, materiel must be designed, constructed and maintained:

- to approved standards.
- by competent and authorised individuals.
- by members of an authorised engineering organisation.
- to a standard that is certified as correct.

All organisations providing technical services and supplies to the RAN must certify the materiel for which they are responsible to ensure it complies with regulatory requirements. The technical regulatory authority is accountable for ensuring that required standards are defined, and that responsible authorities are competent to discharge their responsibilities, are so authorised and have appropriate management systems in place. In an operational environment, the NTRS facilitates the decision making process by ensuring that personnel consider the risk within the mission parameters. In an operational context managing risks provides a winning edge as it allows the command to operate at the limits appropriate to the mission. The NTRS ensures that authorised personnel with appropriate competencies are available to assess and manage risks to technical integrity and provide appropriate advice to the Commanding Officer.

Maintenance Philosophy

The primary objective of maintenance in the ADF is to efficiently and effectively maintain materiel so that:

- an optimum balance between availability and asset preservation is achieved during peacetime to meet preparedness requirements without compromising fitness for service, safety or environmental compliance; and

- availability is optimised during a contingency to meet operational requirements, realising that safety margins and mission worthiness may be varied in a pre-planned manner.

The maintenance requirements of all ADF maritime materiel and its associated characteristics stem from this objective. The RAN operates under the philosophy of two types of maintenance. Preventive maintenance requirements are those determined during the design of a system and aimed at ensuring the system meets the design requirements. Corrective maintenance is performed to restore operational capability when systems fail. Battle damage repair can be considered as a special form of

corrective maintenance. While modern warship systems might not be able to regain combat capability following significant action damage, recent experience confirms that in-depth system knowledge, combined with technical skills, is essential in effecting first aid repairs to save the ship.

The RAN conducts maintenance on two levels. Organic maintenance is that performed within the ship, by uniformed personnel. It may range from simple to technically demanding tasks, required to maintain the platform's capability in the operational zone. External maintenance is that beyond the capacity or competence of the ship's personnel, and is undertaken by uniformed personnel or commercial providers, with the deep skills, expertise and capacity to perform these tasks. External maintenance relies heavily on industry support.

Ship availability is maximised by reducing the requirement for external maintenance. It is, however, impractical to embed the capacity to conduct all maintenance within the ship. As a result there are two competing demands:

- the total preventive maintenance requirement should be minimised through a combination of equipment design and support philosophy; and

- the organic-level component of that maintenance requirement should be maximised (within constraints of mission, resources and competence) in order to improve ship availability.

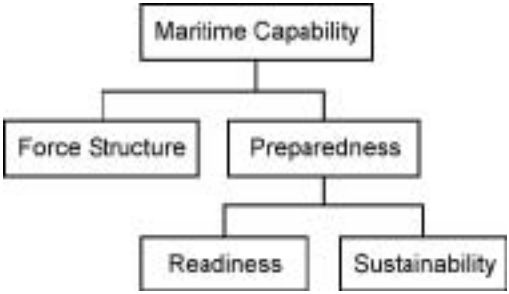
External maintenance assistance relies heavily on industry support. Industry can provide the deep skills, expertise and capacity to perform tasks beyond the organic capacity. The Defence Materiel Organisation (DMO) is tasked with contracting and managing specific work packages for external maintenance.

MARITIME PREPAREDNESS CYCLE

7

- The preparedness of RAN maritime capability is the combination of the readiness of a ship or unit to commit to operations and the ability to sustain the ship or unit during the conduct of operations.
- The RAN manages preparedness of maritime capability within a preparedness management system based upon the higher level strategic guidance provided by government.
- The RAN employs capability under a preparedness continuum consisting of preparation, work-up, operations and reconstitution phases.

Australia's maritime capability is generated from the force structure of the RAN and other maritime assets, and the preparedness of the ships and units that make up that structure. Preparedness, or our ability to undertake maritime operations, is broken down into two elements – readiness, the ability to be committed to operations in a specified time, and sustainability, the effort required in order to maintain operations until successful accomplishment of the mission.



Components of Maritime Capability

This chapter examines the management of preparedness of maritime forces and describes the phases under which they are employed.

Preparedness is managed over four phases:

- **Preparation** – through the conduct of routine peacetime activities, the RAN ensures that the appropriate framework and mechanisms are established for a ship or unit to commence subsequent preparedness phases if required.
- **Work-up** – when appropriate training is provided to reach the required level of operational capability necessary for a potential operation.
- **Operations** – when ships and units are assigned to an operation, deployed to the theatre of operation and actually conduct the operation.
- **Reconstitution** – which is the period when the ship is returned to a lower level of capability, and when immediate maintenance, rest and recuperation and redistribution of supplies occurs.

PREPAREDNESS OF MARITIME FORCES

Readiness

Readiness describes a ship or unit's ability to be committed to operations within a specified time in order to achieve the desired operational outcome. Readiness includes the availability and proficiency of personnel, the serviceability of equipment and facilities, the availability of supplies and support infrastructure and the effectiveness of the RAN's, and the wider ADF's, command and management framework.

The period permitted for a ship or unit to complete its work-up to the required level of capability for a specific operational task is called Readiness Notice. Preparedness of maritime forces must be carefully managed to ensure that the ship or unit can be prepared for the mission inside this timeframe.

Sustainability

Sustainability occurs across all phases, from preparation to reconstitution. Sustainability denotes a ship's or unit's ability to continue to conduct directed tasks, and is measured in terms of personnel, supplies, facilities and support necessary for the ship or unit. The nature and duration of the operation or activity dictate the sustainability requirement. Consequently, sustainment planning is based on an estimation of tempo and forecast

usage rates, and is influenced by competing priorities from concurrent and forecast operations and activities. In reality, sustainability is difficult to predict, being based on future events.

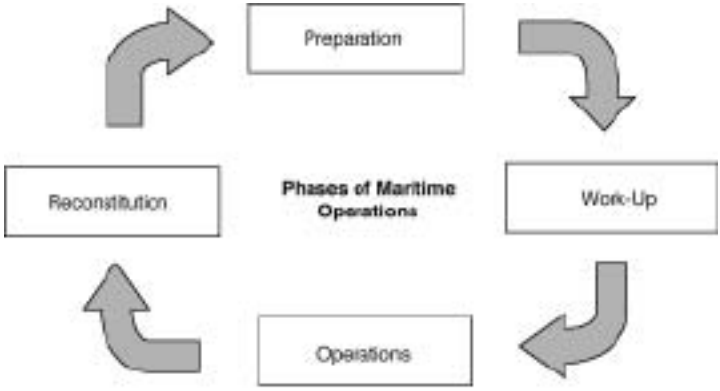
Preparedness Management System

Government strategic policy defines requirements for the defence of Australia and its national interests, and provides the basis for the conduct of strategic appreciations and the development of operational plans.

The key planning documents that drive preparedness are the CDF Preparedness Directive (CPD), which identifies potential contingencies that the ADF is to be prepared to support; and the Joint Operations Command Operational Preparedness Requirements (JOC OPR), which identifies the resources and readiness notices to be maintained for each contingency.

These Defence requirements are managed by the Preparedness Management System (PMS), which provides a mechanism for the translation of government strategic guidance into detailed directions to the RAN to provide maritime outcomes for government. The PMS includes guidance on the roles and tasks to be performed within a specified budget. As such the system provides the basis for the allocation of resources to the RAN. The two sides of the preparedness equation (readiness and sustainability) are drawn together in the PMS.

PREPAREDNESS IN EACH PHASE OF MARITIME OPERATIONS



The Phases of Maritime Operations

The preparedness of individuals, ships or units is an integral and fundamental consideration for each phase of maritime operations.

At any given time, depending on the tempo of operations and the level of maritime capability required, different individuals, ships or units will be at different levels of preparedness and in different phases. The RAN consistently faces the challenge of consecutive and concurrent operations in multiple theatres. Many of these are long-term commitments, and each has required a distinct set of maritime capabilities.

Throughout these phases Force Element Group (FEG) Commanders are responsible for managing the capability implicit in each ship or unit from entry into service until disposal, on behalf of the Maritime Commander (MC). This is a management rather than a command function. Commanding Officers of ships and units are responsible for the operational effectiveness and safe conduct of their unit and the safety of all personnel onboard.

Preparedness Complexity

The demands placed on the RAN in 2003 provide a good illustration of the degree of complexity that can arise when managing the preparedness of maritime capability. In 2003 the RAN conducted concurrent operations in multiple theatres. In Bougainville a long-term commitment to peace monitoring was concluded; in the Solomon Islands assistance to the government began and in the Middle East units participated in the Iraq War. In addition, the RAN was committed to ongoing border protection and fisheries patrol activities. Each ship or unit employed on these operations or activities was at a different phase of preparedness and required distinct types of maritime capabilities.

Preparation Phase

The RAN is always preparing for the next contingency. Consequently the preparation phase equates to the RAN's routine activities. The preparation phase also involves a warning period when an individual, ship or unit is identified and formally warned of a possible contingency.

During the preparation phase the MC ensures that Navy's fleet has the capabilities stipulated in strategic guidance. For a particular contingency the MC must ensure that the force generation requirements are shaped by:

- government policy objectives and the strategic concept;
- an understanding of the military conditions for success and end-state;
- assessment of the threat;
- the forces available and their readiness;
- the time available to respond; and
- the likely duration of the campaign.

To ensure each ship or unit is appropriately prepared for its intended employment, the MC expects each FEG Commander to develop a plan that meets known operational, preparedness, exercise and international engagement requirements for the ship or unit. The FEG Commander then coordinates the input of the various service providers and suppliers who collectively enable the ship or unit to meet the MC's requirements. In carrying out this role the FEG Commander develops a framework of cooperative relationships with suppliers and providers, particularly the Defence Materiel Organisation (DMO). The Combat Support Group (CSG) of Maritime Command also performs a vital role during the preparation phase by coordinating activity between FEGs and providing specialist logistic, personnel and engineering advice and support to FEG staff and ships or units.

Typically during the preparation phase the focus is upon repair and maintenance, inventory management, individual training and collective team training. This phase will also include periods of equipment tests and evaluation. If significant and lengthy maintenance has taken place during the preparation phase the period will conclude with detailed materiel and safety inspections as well as intensive training periods for all personnel to ensure the ship or unit is safe and ready to proceed to sea.

Commanding Officers are responsible for ensuring that their ship or unit moves through the 'preparation' phase and subsequent 'work-up' phase to reach the 'operations' phase of the continuum. This responsibility includes ensuring that the ship or unit is fully crewed and appropriately trained.

Work-up Phase

The objective of the work-up phase is to efficiently and effectively raise the ship or unit to the level of capability required for the planned subsequent tasking. The Commanding Officer manages this process, assisted by the Australian Fleet Sea Training Group.

The RAN employs three levels of work-up. The level selected is dependent on planned subsequent tasking:

- **Mariner Skills Work-up**. This is designed to prepare a ship to safely conduct activities in the vicinity of Australia. The accompanying mariner skills evaluation sets the minimum acceptable standard for skills that are considered essential for operations in the maritime environment. The focus of the mariner skills evaluation is on the skills and systems that contribute to the safety of the platform and its crew. Specific higher level skills are built upon these mariner's skills. Examples of mariner skills are damage control, fire fighting, boatwork, and mooring.

- **Unit Readiness Work-up**. This prepares a ship for low-level operations, deployments and exercises remote from Australia. This encompasses the maintenance of core skills, safety and professional standards. The accompanying unit readiness evaluation involves a complete assessment of all disciplines across all departments. An important aspect of unit readiness is that the ship has a latent capability to be worked up to a specific mission readiness level in a reduced timeframe. Examples of unit readiness are weapons proficiency and stores support.

- **Mission Readiness Work-up**. This is used to prepare a ship or task group for higher level operations and activities. The form and duration of a mission readiness work-up is determined by the mission's requirements, which are usually stipulated by higher authorities such as the Maritime Component Commander or Chief of Joint Operations Command. A mission specific work-up package will be developed and executed. The accompanying mission readiness evaluation builds upon the unit readiness standard, focusing on mission critical and supporting departments.

Preparing for the Arabian Gulf

HMAS *Stuart (III)* followed this work-up progression throughout 2003/04. Following commissioning in 2002 the ship completed a mariner skills work-up to ensure it was safe to conduct acceptance trial activities within Australian waters. The ship then undertook a unit readiness work-up prior to commencing border protection activities to Australia's northwest. Finally, in 2004, *Stuart* undertook a mission readiness work-up to prepare it for deployment to the Middle East for operations in the Arabian Gulf with coalition forces. Each stage of this progression built upon the capability attained during the previous stage.

Operations Phase

The operations phase is effectively the conduct of operations or assigned tasks in accordance with promulgated orders such as an operations instruction or an exercise directive. Deployment to a theatre of operations involves mounting, embarking, and sailing the force from home bases, passage to the area of operations and transit and arrival in the theatre of operations in a posture appropriate to the threat and mission. The Maritime Component of Joint Operations Command and the CSG provides and coordinates support to ships or units throughout the operations phase.

Reconstitution Phase

Reconstitution is the process by which, at the conclusion of the operations phase, individuals, ships or units reassume or recover to identified preparedness levels required by strategic policy. The reconstitution phase begins with the redeployment of forces from the operational area and concludes when the forces are returned to the preparation phase. Reconstitution is not aimed at rectifying any enduring deficient areas in the RAN, such as shortages of specialist personnel. Reconstitution focuses upon respite for personnel, recovery of the material condition of ships and units, and rebuilding of skills levels.

Prolonged heightened levels of maritime operational tempo during the first years of the 21st century have reinforced the importance of the reconstitution phase. Reconstitution is an entrenched part of the operational planning process and is acknowledged as a whole of RAN activity.

The RAN's opportunity to reconstitute will be determined by government operational priorities. The RAN has limited discretion in this regard, so must be prepared to capitalise on periods of reduced operational tempo in order to reconstitute. The RAN's commitment to reconstitution activities may require reduced participation in exercise activities, international engagement opportunities, and also a reduced level of preparedness for short notice operations. The appropriate balance between these extant commitments and reconstitution objectives will be determined by the Chief of Navy and will be reflected in ship or unit scheduling within the Fleet Activity Schedule.

Reconstitution must be undertaken in a focused manner, guided by a strategic-level plan that addresses the areas of capability that have been eroded by high tempo operational employment. A clear reconstitution end-state must be described and resources must be assigned to achieve these identified objectives. Areas to be considered in a reconstitution plan include:

- personnel aspects, particularly;
    - leave,
    - career development of individuals, and
    - individual position prerequisite training.
- maintenance, repair and materiel condition, including auditing of major systems;
- collective training in warfighting skill areas not utilised during recent operational employment;
- inventory replenishment; and
- team building and reinvigoration activities such as sport and adventure training.

Based on the priorities agreed in the strategic level reconstitution plan each ship or unit Commanding Officer is to ensure that reconstitution objectives are achieved. Maritime Headquarters and FEG Commanders also have a role to play in delivering a fully reconstituted capability at the conclusion of the reconstitution phase.

Reconstituting the RAN

In 2003/04 the Chief of Navy implemented a whole of Navy reconstitution period to enable the Fleet to recover from the high tempo operations it had been sustaining since 1999. Reconstitution of people, the materiel state of the Fleet, and warfighting skill recovery were afforded a priority second only to operations directed by the government. The scope of international engagement and level of exercise participation were reduced in order to facilitate the priority given to reconstitution.

SURFACE COMBATANTS

8

- The highly capable surface combatant is well placed to provide a flexible and rapid response to the broad range of threats that may arise in Australia's large sovereign area, as well as supporting our nation's global interests further afield.
- Surface combatants provide unique capabilities that complement other elements of the ADF force structure to ensure a layered defence or concentration of effects against a wide range of threats.

The dreadnought battleship, nuclear powered submarine and the aircraft carrier were all hailed as the manifestation of the capital ship at various times during the 20th century. Today, it is the thoroughbred warship or surface combatant that provides the majority of nations with the ability to exercise power at sea.

HISTORY

After the Australian government decided in 1909 to establish an Australian Fleet Unit based on the most modern warship designs, the first elements of this new unit – the destroyers HMAS *Yarra* and HMAS *Parramatta* – reached Australian waters in November 1910. In June 1912 a third destroyer, HMAS *Warrego*, was commissioned at Sydney and in 1913 the battlecruiser HMAS *Australia* and the light cruisers HMAS *Melbourne* and HMAS *Sydney* arrived in Australian waters. The Australian Fleet Unit entered Sydney Harbour for the first time on 4 October 1913, forming the basis for what we now refer to as the surface combatant force.

Augmented by the light cruiser HMAS *Encounter* and the small cruiser HMAS *Pioneer*, these ships all saw initial active service during WWI in the Pacific and Indian Oceans. HMAS *Australia*, in particular, was an important influence and constraint on German naval operations in the Pacific, and all of Australia's surface combatants contributed to operations to capture Western Samoa and German New Guinea in late 1914. The RAN also began the vital role of escorting troop convoys to the Middle East, during the course of which the cruiser HMAS *Sydney* destroyed the German light cruiser SMS *Emden* at the Cocos Islands. After the removal of the German naval threat in the

Pacific and Indian Oceans during the first three months of the war, Australia's major warships were redeployed to serve with the British Grand Fleet in the North Sea and on operations in the Mediterranean and Adriatic.

The interwar period saw the surface combatant force fluctuate in strength, reaching its lowest ebb with only two cruisers in full commission in the early 1930s. Despite this, during the period RAN cruisers conducted a wide variety of operations in regional waters, and annual exchanges with Royal Navy cruisers on the China and Mediterranean Stations. In 1927 HMAS *Adelaide* was sent to the Solomon Islands to help put down a native uprising. At the onset of WWII the RAN possessed two heavy cruisers, four light cruisers, five destroyers, and three sloops, with additional vessels under construction. The surface combatants of the RAN saw action in the North, West and South Atlantic, the Caribbean, the Mediterranean, the Indian Ocean, the Persian Gulf and Red Sea, and the Pacific Ocean. Combat losses during the war were heavy. The cruisers HMAS *Canberra*, HMAS *Sydney (II)* and HMAS *Perth* were sunk, as were the destroyers HMAS *Nestor*, HMAS *Vampire*, HMAS *Voyager*, HMAS *Waterhen* and HMAS *Parramatta (II)*, and the sloop HMAS *Yarra (II)*. The cruiser HMAS *Australia (II)* was twice badly damaged by Japanese kamikaze aircraft, the cruiser HMAS *Hobart* was torpedoed, and a number of other surface combatants were damaged by enemy action.

Since the end of WWII, RAN surface combatants have been regularly deployed on active war service and peacekeeping roles in the Korean War, the Malayan Emergency, the Indonesian Confrontation, the Vietnam War, the 1991 Gulf War, East Timor, and the 2003 Iraq War. They have also become increasingly involved in an expanding range of constabulary tasks, such as Southern Ocean fisheries protection and border security roles. The acquisition of the three *Perth* class guided missile destroyers in the early 1960s brought the RAN into the era of guided missiles and three-dimensional search radar, providing an area air defence capability. The purchase of the *Adelaide* class guided missile frigates (FFG) in the early 1980s incorporated helicopters into the weapons and sensor suites of RAN surface combatants. The subsequent *Anzac* class frigates (FFH) have maintained a potent naval gunfire support capability and are introducing a littoral anti-surface attack capability with the Penguin missiles of the SH-2G (A) Super Seasprite helicopters.

OPERATIONAL ENVIRONMENT

Australia's strategic circumstances, outlined briefly in Chapter 4 of *Australian Maritime Doctrine*, suggest the potential breadth of operations required to preserve Australia's interests at sea. When combined with the distances and extremes of weather conditions that determine the feasibility of such operations, it is apparent that the requirements can only be met in a single unit through the distinguishing characteristics of the surface

combatant: mobility in mass, access, readiness, flexibility, adaptability, reach, poise and persistence, and resilience.

The Military Threat

To effectively conduct the military role, the surface combatant is expected to counter a range of threats to the extremes of all environmental conditions. In the traditional military environment, these threats include:

- submarines capable of surveillance and intelligence operations, laying mines, and launching anti-ship torpedoes and missiles;
- fixed-wing and rotary-wing aircraft similarly capable of surveillance and intelligence operations, laying mines, and launching a range of anti-ship missiles, guided and unguided bombs;
- surface combatants with similar capabilities and characteristics to our own, including embarked helicopters;
- smaller combatants and fast attack craft, usually armed with guns and/or anti-ship missiles and particularly capable of operations in the littoral;

- land-based forces, including artillery and battlefield, cruise and ballistic land-attack missiles, and artillery; and

- intelligence and surveillance systems, ranging from land, air and space-based strategic systems to tactical level platforms, and personnel.

Surface combatants must also be capable of responding to a range of asymmetric threats, while meeting an increasing number of diplomatic and constabulary operations, including:

- unconventional attacks from terrorists or militias, proliferation and use of unconventional capabilities including biological, chemical and radiological weapons, and attacks on information systems; and

- terrorism, international organised crime, piracy, illegal fishing, quarantine infringements, drug and arms smuggling, and illegal immigration.

The Military Environment

In the combat role, the focus of most navies, including the RAN, has changed since the late 1980s from Cold War open-ocean combat to operations in the littoral. Recalling the fundamental doctrinal principle that maritime forces seek to establish sea control and/or sea denial in order to conduct the military task of maritime power projection, and to permit the use of sea lines of communication, the complexity of the littoral environment provides significant challenges for maritime forces. This is particularly so for the ubiquitous surface combatant force, which must dominate the battlespace in order to provide air, surface, and sub-surface cover for other naval, land, and air assets.

In operations where other elements of the ADF are deployed, surface combatants must operate as an integral part of the ADF's overall joint capability, in cooperation with submarines, maritime air and land forces. Surface combatants provide unique capabilities that complement other elements of the ADF force structure to ensure a layered defence or concentration of effects against a wide range of threats. In the context of the defence of Australia, surface combatants must be able to contribute to simultaneous operations in widely separated locations.

To achieve the government's goals, ADF operations are anticipated in both the littoral and open-ocean environments, in areas both proximate to and remote from Australia, and exhibiting large climatic variations. The capacity of the surface combatant force to deploy around the globe to achieve these requirements has been well demonstrated. RAN surface combatants have operated off the north Australian coast, in the Southern and Indian Oceans, the Persian Gulf, South East Asia, North Asia and the Pacific Ocean

in recent years. In 2002-03, RAN surface combatants simultaneously sustained major operational deployments to the Persian Gulf (Operations Slipper, Falconer and Catalyst) while undertaking border protection operations to the north of Australia (Operation Relex II).

The backbone and real power of any navy are the vessels which, by due proportion of defensive and offensive powers, are capable of giving and taking hard knocks.

Alfred Thayer Mahan,
The Interest of America in Sea Power, 1896

CAPABILITY

The Current Surface Combatant Force

The RAN's current force consists of six *Adelaide* class FFGs derived from the USN *Oliver Hazard Perry* (FFG7) class, and eight *Anzac* class FFHs, derived from the German MEKO 200 frigate design. The two oldest FFGs will be removed from service from 2006.

Significant upgrades are in train or planned for both classes of ship in order to maintain their effectiveness in a multi-threat environment. Both classes will have significant and uniform capabilities including the Harpoon anti-ship missile providing a significant anti-surface warfare capability, good close range Anti-Air Warfare (AAW) capability through the Evolved Sea Sparrow Missile (ESSM) and Phalanx Close-In Weapon System, a strong defensive undersea warfare suite, and the highly capable Link 16 tactical data link system.

The FFGs have a 76mm dual-purpose gun, and a limited area air warfare capability with the Standard SM-1 missile. The four remaining FFGs are being progressively fitted with the long range Standard SM-2 missile, which will provide an improved, although not leading edge, area AAW capability. FFGs embark and operate one or two Sikorsky S-70B-2 Seahawk helicopters, which are fitted with an ASW sensor suite and carry lightweight torpedoes. The Seahawk is also a very capable surface search and targeting platform for the Harpoon missile.

The FFH has good close range air warfare capability with ESSM, very good conventional

surface warfare and naval gunfire support capability with a 5-inch gun, and can embark and operate either a single S-70B-2 Seahawk or a single SH-2G(A) Super Seasprite helicopter. The Seasprite sensor suite is optimised for anti-surface warfare, and the helicopter will be able to launch the Penguin anti-ship missile in addition to providing search and target reports for the Harpoon missile.

The Air Warfare Destroyer

Australia plans to acquire three ships of a new class of surface combatant, the Air Warfare Destroyer (AWD), with the first ship due to enter service in 2013. These will be highly capable combatants that, while focused on overcoming current area AAW deficiencies, will also have an enhanced capability in the other warfare areas. Significantly, they will have a much-increased command and control capability through implementing advances in communications capabilities and network centric warfare concepts, including the Cooperative Engagement Capability that exchanges fire control quality, composite sensor measurement data around the force, and improves track and identification continuity, in near real time.

The AWD will provide a central capability for the RAN to participate and coordinate operations in a variety of low, medium and high threat scenarios well into the future. Their inherent AAW capability will provide a coordinated capability with the RAAF's new AEW&C and fighter aircraft to provide sea control in the littoral and on the high seas.

MILITARY TASKS

In situations beyond the reach of friendly land-based air power, or where operations must be continuously maintained for extended periods, surface combatants provide the most viable military option. Their sensors and weapons can be employed in the undersea, surface and air environments at the same time. Unlike most other combat units, surface combatants are fully self-contained and offer great flexibility to meet changing operational circumstances. Multiple tasking and re-tasking is common in mid-deployment, with little or no detriment to the operational efficiency of the ship. Nevertheless, in most circumstances the maintenance of sea control will require a joint force where the strengths of the unified force minimises the limitations of each of its constituent units.

The surface combatant's primary mission is to establish and maintain sea control in a hostile, multi-threat environment. The surface combatant must be able to destroy or neutralise enemy submarines, aircraft, and ships, that is, to conduct effective anti-submarine, anti-air and anti-surface warfare (ASW, AAW and ASUW). Not only must the combatants have the necessary weapons and sensors, but they also must have the personnel skilled in their use supported by an efficient command and control, communications and intelligence infrastructure. This requires significant training and exercise programs to establish and maintain proficiency. Underpinning the ship's ability to fight, and fundamental to the whole ship entity, is the indispensable support provided by the ship's engineering and logistic infrastructure.

Effective action in the ASW, AAW and ASUW environments requires a surface combatant to coordinate organic, task group and aircraft sensors, and fuse the information – which may include intelligence from other sources outside the task group – into a recognised picture before initiating and coordinating offensive or defensive action. In certain circumstances the surface combatant may be required to coordinate the actions of friendly submarines which may be acting in support of the force at sea.

Depending on the scope of the maritime operation, surface combatants must be able to operate independently or as part of a joint or combined force. Each class of surface combatant contributes to all the maritime operations discussed in Chapter 7 of *Australian Maritime Doctrine*. In most cases, the surface combatant will be the primary provider of mobile, sustained combat power at sea, with the cumulative effect of different offensive and defensive capabilities progressively producing a balanced capability across the maritime battlespace.

Sea Lines of Communication

If sea lines of communication (SLOC) have been secured over wide areas, then commercial and military shipping may transit without threat. If an adversary is directly contesting use of SLOC, shipping will require close protection. Surface combatants have a key role to play in both securing SLOC, and in close protection of merchant shipping.

Maritime Power Projection

Maritime power projection may include the landing of amphibious or special forces, the delivery of land forces by sea, and the provision of bombardment by guided or unguided weapons from seaborne platforms.

In establishing the majority of conditions for the conduct of maritime power projection, surface combatants may protect the advance force hydrographic, mine warfare and clearance diving operations that clear the way for follow on forces. They will usually protect the amphibious or other maritime power projection forces, both during transit and inside the area of operations. Maritime power projection operations may occur over several days or weeks, depending on the circumstances, which emphasises the importance of the surface combatant's endurance.

Lastly, surface combatants can use their own guns, missiles and electronic warfare systems in the offensive projection of power over land. Naval gunfire support (NGS)

may be used in support of amphibious operations and other land force operations ashore, as most recently demonstrated in operations in Iraq in 2003. An effective NGS capability may reduce the amount of land-based artillery required in-theatre, thereby easing the logistic demands on the amphibious force.

Persian Gulf - March 2003

This element of recent coalition operations demonstrates the surface combatant's capability to support land operations in a littoral area of challenging navigational and environmental characteristics. In addition to the risk of sea mines and a possible threat from mobile, shore-launched anti-ship missiles, the units were navigationally constrained by murky, shallow, poorly surveyed water, fast moving tidal streams, and seasonal high winds. Prior to Coalition operations ashore, RAN surface combatants played a major role in establishing sea control to allow freedom of manoeuvre offshore. The significant experience gained through regular operations in the region since 1990 was fully exploited by both the RAN units and deployed command staff who were given a key role to command and coordinate the maritime interception effort enforcing UN Security Council Resolutions against Iraq.

Shortly before midnight on 21 March 2003, HMAS *Anzac (III)* proceeded up the Khawr Abd Allah waterway in company with HMS *Marlborough* to a position close to the Al Faw Peninsula in southern Iraq to prepare for gun action in support of forces ashore. At 0604 *Anzac* began firing 5-inch (127mm) high explosive shells in direct support of the Royal Marine assault. Over the next few days, *Anzac* conducted seven fire missions in total, with all rounds hitting their directed targets. *Anzac* was supported by the 4.5-inch (114mm) gunfire of the Royal Navy frigates HMS *Chatham*, HMS *Richmond* and the destroyer HMS *Marlborough*.

CONSTABULARY TASKS

Surface combatants are built to fight and win in combat, and the resources and skills developed for warfighting underpin their ability in the constabulary role. They have larger crews than most other RAN ships, and have sophisticated command, control and communications capabilities, helicopters, boats and stores, all with broad application across the span of maritime operations.

Highly capable naval forces are essential elements of Australia's political influence, enhancing stability, promoting inter-operability among allies and coalition partners,

deterring aggression, providing rapid response to political instability and natural disasters, enforcing national and international legislation and supporting national interests at home and abroad. Surface combatants contribute to a range of constabulary tasks, such as enforcing environmental, fisheries, immigration and quarantine laws, peace keeping and peace enforcement tasks.

DIPLOMATIC TASKS

Due to those resources and skills developed for warfighting, surface combatants also contribute to a range of diplomatic tasks, from the provision of various forms of assistance, through presence to more coercive deterrence. The intrinsic value of the surface combatant as a diplomatic tool should not be underestimated. Against the backdrop of a potent symbol of maritime power the hosting of reception events, trade fairs and the like in foreign ports has historically generated goodwill and fostered mutual understanding with host nations and visitors. Similarly, these visits have allowed the ship's companies to conduct a range of community liaison and charity tasks to further cement relationships.

AMPHIBIOUS MANOEUVRE OPERATIONS

9

- The defining characteristic of amphibious forces is their cross-environmental mobility and carrying capacity that makes them particularly suited to manoeuvre warfare.
- Amphibious forces are primarily used for combat operations from the sea, but their lift capacity and support capabilities also make them well suited for constabulary and diplomatic tasks such as peace operations and disaster relief.

HISTORY

The first Australian amphibious operation was conducted during WWI when sailors of the Australian Naval and Military Expeditionary Force landed at Kabakaul to capture the wireless station at Bitapaka in German New Guinea on 11 September 1914. After initial strong resistance the German governor capitulated, and the territory eventually became an Australian mandate. Following the experience of the unsuccessful Gallipoli campaign, amphibious warfare entered a hiatus in the inter-war years, although Australian forces did conduct some joint landing exercises during the 1930s.

During the South West Pacific campaign in WWII a succession of amphibious landings was conducted in New Guinea, New Britain, the Philippines and Borneo. A major amphibious training establishment, HMAS *Assault*, was developed at Port Stephens. In 1943 the Infantry Landing Ships HMAS *Manoora*, HMAS *Kanimbla* and HMAS *Westralia* re-entered RAN service after their conversion. They participated in a range of operations, carrying Australian and American troops into action at Morotai, Hollandia, Leyte and Lingayen Gulf, Tarakan, Brunei, Balikpapan, and Wewak. RAN cruisers, destroyers, minesweepers, and small craft provided escorts, naval gunfire support and hydrographic support to the landings.

Unfortunately this core of expertise in amphibious operations was not maintained. From the mid-1950s the focus on Cold War counter-insurgency operations and continental defence led to reductions in government spending on capabilities such as amphibious warfare. Nonetheless, a vestigial capability did exist throughout the period. Six Mark 3 tank-landing ships were loaned from the Royal Navy (RN) from 1946 to 1955. After their

disposal the Australian Army operated four Mark 5 Medium Landing Ships from 1960 to 1971. During the Vietnam War the RAN operated the former aircraft carrier HMAS *Sydney (III)* as a fast troop transport, but the ship was limited in its usefulness in this role due to its inability to self-unload across an unprepared shore, and the inability to carry heavy vehicles such as tanks. By the late 1960s, the Vietnam experience convinced the government that the Australian Defence Force (ADF) required some specialised amphibious vessels, and that these were to be operated by the RAN.

The six *Balikpapan* class heavy landing craft, originally ordered for the Australian Army but transferred to the RAN during construction, were the first to enter service from 1972, followed by the heavy lift ship HMAS *Tobruk (II)* in 1982. The training ship HMAS *Jervis Bay* also provided a supporting military sealift capability from 1977 to 1994. Two *Newport* class tank landing ships, HMAS *Manoora (II)* and HMAS *Kanimbla (II)*, were acquired in 1994 from the United States Navy (USN) and converted to meet Australian requirements. The fast catamaran HMAS *Jervis Bay (II)* was chartered for two years in June 1999 to provide additional troop lift and took part in the East Timor operation. The RAN's amphibious ships have provided support to operations in Somalia, East Timor, Bougainville, the Solomon Islands, and the 2003 Iraq War.

OPERATIONAL ENVIRONMENT

Like other maritime forces, amphibious forces possess mobility in mass, but their defining characteristic is their unique cross-environmental mobility and this allows them to contribute to military, diplomatic and constabulary tasks.

In periods of tension putting a maritime force to sea can be a prudent contingency, providing a gesture of support towards allies or a threat to adversaries. Its capacity to provide sustained forward presence is a powerful diplomatic tool, while its ability to manoeuvre freely at sea can be used to escalate or defuse tensions. A properly constituted amphibious component broadens the potential scope of a maritime force, allowing evacuation or intervention operations to be mounted. It is this ability to poise close to potential trouble spots and react quickly, in mass, that makes an amphibious force more flexible than a mere sealift force. If pre-positioned, it is the fastest acting intervention force available to the government, even quicker than airlifting forces from distant mainland bases. Properly constituted, it carries sufficient combat weight to act alone in many scenarios or to form the nucleus of a heavier force in others.

A self-contained and sea based amphibious force is the best kind of fire extinguisher because of its flexibility, reliability, logistic simplicity and relative economy.

Sir Basil Liddell Hart
Deterrence or Defence, 1960

Perceptions of what constitutes an amphibious landing tend to be polarised. At one extreme they are seen as suitable only for entirely benign circumstances while at the opposite they conjure images of murderous assaults on strongly defended beaches. Both extremes largely miss the point. The former represents a sea transport capability that could theoretically be allocated to auxiliary forces or civilian contractors. The latter reflects a form of positional warfare which is the antithesis of the manoeuvre capability inherent in amphibious forces.

The concept of manoeuvre warfare is, in its simplest form, to employ movement to apply one's own strength against enemy weakness while avoiding the reverse. This is not a new concept, as more than two thousand years ago the Chinese military philosopher Sun Tzu espoused using the 'indirect approach' to strike at an enemy's key vulnerabilities.

Australia's maritime region is an environment in which the purest forms of manoeuvre theory can be applied. The practise of bypassing and isolating enemy strong points is much easier when one side can dominate the sea, while denying it to an enemy. Equally, striking key vulnerabilities from the sea is infinitely more practicable when nearly all the key military and economic infrastructure is within 20 miles of the coast. While manoeuvring at sea even a relatively modest landing force is capable of pinning down an opposing force many times its own strength. In the complex terrain that exists ashore in the region large land formations are constrained by road infrastructure, easily delayed, and take time to move into their combat formations. An amphibious force can move 250nm a day and choose where, when and whether to land. The amphibious force, therefore, will nearly always have the initiative up to the point of landing.

Once committed to a landing, the critical factor is putting forces ashore quickly enough to stay ahead of the adversary's reaction cycle. Consequently the parameters by which amphibious capability can be measured include not only how much land combat power it can deliver but also how fast and in what conditions it can be delivered.

> It is misleading to measure an amphibious force by weight alone. Agility is equally important.
>
> ***Major General Jim Dutton, RM***
> Commander UK Amphibious Forces, 2004

The agility of an amphibious force depends on specialist equipment including purpose built amphibious assault ships, landing craft, helicopters and amphibious vehicles. The measures of capability of an amphibious platform include:

- command and control facilities suitable to fight a complex, coordinated, multi-dimensional tactical battle;
- sensors, weapons and systems to enhance survivability;
- troop, vehicle and combat supplies carrying capacity;
- landing craft numbers, launching and recovery limitations, launch preparation and turnaround times, and maintenance facilities;

- landing craft carrying capacity, speed, seakeeping and beaching and extraction abilities;

- helicopter numbers, hangar space, lifts, maintenance facilities, mission-planning facilities, ships helicopter operating limits, fuelling arrangements, control arrangements, operating spots, parking space and deck management arrangements; and

- helicopter range, payload, survivability, operating limits, deck footprint, hangar footprint, hangar-to-launch preparation time, landing-to-stowaway time and maintenance requirements.

Less obvious, but equally critical, is the matching of these pieces of equipment to one another and to the landing force equipment. This is an iterative process and allowing any one piece of equipment to drive the entire system requirement invariably results in imbalance.

The requirement to carry four large hovercrafts dominated the design of the USN's *Whidbey Island* class LSDs. The huge dock left insufficient space for vehicles and cargo to generate an effective second or third wave. This was not an insurmountable problem for the USN, where these ships nearly always form part of a team, in company with different designs. Nonetheless the subsequent *Harper's Ferry* variant had a smaller two-craft dock in order to achieve a better balance between carrying capacity and landing capacity.

In summary, Australia's numerically small but technologically advanced forces are suited to manoeuvre rather than attrition. In our geographic situation the scope for manoeuvre in the land environment is limited. The environment favours joint manoeuvre, exploiting the sea to bypass and dislocate enemy forces, and amphibious operations are central to this.

CAPABILITY

From the end of WWII until the 1990s the government and the single-Services gave amphibious operations a low priority. Consequently the existing amphibious force is comprised of equipment that was not, in most cases, designed for the purpose for which it is now used. This has an effect on the way in which ADF operations are currently conducted and on future ADF equipment aspirations.

Amphibious Ships

The *Newport* class tank landing ships were designed for the USN in the 1960s as fast transports capable of keeping pace with a battle group, with the ability to beach themselves and deliver tanks immediately after the initial assault had secured the beachhead. HMAS *Kanimbla (II)* and HMAS *Manoora (II)* have been modified extensively for ADF purposes. They have lost the ability to beach and gained cranes, landing craft, helicopter facilities and greatly improved command and control and medical facilities. Up to four Australian Army Blackhawk helicopters or three Sea King helicopters can be carried in the hangar. Two Australian Army mechanised landing craft (LCM8) can be carried on the forward flight deck and launched using the 70 tonne crane. The self-protection of the ship is limited to the Phalanx close in weapon system, Machine guns, SRBOC self-defence system, and the RBS-70 point defence missile when Army ground-based air defence units are embarked. The ships have a top speed of 20 knots.

The ships are capable of carrying 450 troops together with their vehicles and equipment. The stern door provides access to 810 square metres of storage space on the vehicle deck, including 229 lane metres of vehicles.

Heavy Landing Ship

HMAS *Tobruk (II)* is a modification of the British *Sir Bedivere* class logistic landing ships, which were originally completed for the British East India Steam Navigation Company, to British Board of Trade design rules, and operated by the Royal Fleet Auxiliary. The ship is a multi-purpose troop and vehicle carrier, which incorporates facilities for bow and stern loading, a drive-through capacity, and inter-deck transfer ramps. The ship can beach and land tanks and other heavy equipment provided the beach and weather conditions are suitable, however, such operations place strain on the hull and increase the ship's vulnerability to hostile action. The self-defence capability is limited to four .50 cal machine guns, with only navigational radars for the detection of hostile aircraft or surface craft. Slow speed also makes the vessel vulnerable. It has gained landing craft, better cranes and rudimentary command and control and helicopter facilities. Although lacking a hangar, the ship can embark up to two Sea King helicopters.

HMAS *Tobruk (II)* can carry 18 Leopard tanks, 24 trucks or 16 shipping containers in the tank deck and 5 tanks, 40 armoured personnel carriers, or 29 containers on the vehicle deck. The vehicle deck has been strengthened to carry two Army LCM8 landing craft as deck cargo and launch them using the derrick, and two smaller vehicle and personnel landing craft (LCVP) on davits. Naval lighterage equipment can also be carried on the vehicle deck, by foregoing two landing spaces, the LCM8s, and some vehicle capacity.

Troop capacity is 315 for extended duration or up to 520 for short periods. Cargo capacity is 1300 tons or 330 lane metres of vehicles. The ship has a top speed of 16 knots.

Heavy Landing Craft

The *Balikpapan* class heavy landing craft (LCH) are capable of undertaking oceanic passage in moderate sea states. Their slow speed and lack of any self-defence capability other than machine guns makes these craft vulnerable to hostile action. The LCH can mate their bow ramp to the stern ramp of HMAS *Tobruk (II)* and the amphibious ships, allowing for vehicles and equipment to be transferred between units. The maximum cargo load of the craft is governed by the load-fuel balance. A load of 175 tonnes gives the ship a maximum range of 1300nm, increasing to 2280nm for a load of 150 tonnes. They can carry up to two Leopard medium tanks, 23 quarter-tonne trucks or 13 armoured personnel carriers. In ship-to-shore operations, 400 fully equipped troops can be carried, but only 60 for calm weather coastal passages. Top speed is approximately 9 knots.

Other Landing Craft

The RAN operates four LCVP from HMA Ships *Tobruk (II)*, *Manoora (II)* and *Kanimbla (II)*. The LCVP can carry one Land Rover size vehicle or 36 personnel. The Australian Army operates 14 mechanised landing craft (LCM8) and a number of lighter amphibious resupply cargo – Mark V (LARC-V) vehicles. The LCM8 can carry a single Leopard medium tank or equivalent or up to 200 troops in ship-to-shore operations. The LARC-V is capable of carrying cargo across the shore and beyond the beach and can deploy directly into the water from the stern ramps of the amphibious ships.

MILITARY TASKS

In the military environment, RAN amphibious ships are designed primarily to conduct combat operations from the sea. The three tasks for which the amphibious ships are used are maritime mobility, amphibious operations, and support to operations on land.

Maritime Mobility

The simplest means of moving forces in the maritime environment is sea lift. This involves embarking land forces from a port or harbour and landing them in another port or harbour. The limitation of this type of operation is that developed port facilities are required at both the point of departure and arrival, and because the movement is not tactical, the troops are likely to require a significant period of time to prepare for operations after landing.

In a benign environment this task can be undertaken by chartered or contracted civilian sea lift ships, rather than using amphibious ships to conduct military sea lift operations. However, in higher threat environments military sea lift by RAN amphibious ships will be the preferred option due to issues of insurance and liability.

Amphibious Operations

Amphibious operations seek to exploit the mobility of seaborne forces to seize key objectives, turn flanks, and interdict lines of communications. They differ from maritime mobility operations in that the embarked land forces are transported and disembarked in a high state of tactical readiness in the absence of developed facilities. Five types of amphibious operation are described in Australian joint doctrine:

- **Raid**. Any operation in which it is planned to withdraw immediately on achievement of the objectives. Traditionally these are thought of as small-scale commando or special forces operations but can in fact be quite large undertakings, lasting for up to 72 hours.

- **Demonstration**. A feint or deception, designed to mislead an opponent into a course of action which suits the purposes of the ADF commander. In 1991 a relatively small US amphibious force tied large Iraqi formations to the defence of the coastline of Kuwait by this technique, thereby preventing them from contributing to the battle.

- **Assault**. An assault is a landing against a hostile or potentially hostile shore. It is important to understand that this does not imply landing on a strongly defended shore. In 1982 the British task force elected to land where the Argentinian defence was weakest, at San Carlos. An advance force landed covertly and, with the help of naval gunfire, drove away the small number of Argentinian defenders. The subsequent landing was, nonetheless, defined as an assault.

- **Withdrawal**. An amphibious withdrawal is, potentially, the most difficult of all amphibious operations as the element of surprise is difficult to achieve. It is not, however, impossible and the withdrawal from Gallipoli in 1915 achieved such surprise that it was complete before the Turkish forces could react.

- **Military Support Operations**. This is an all-encompassing term for any support provided by amphibious forces in tasks ranging from famine and disaster relief to peacekeeping and humanitarian assistance.

Support to Operations on Land

Amphibious ships provide support to operations on land, including resupply through embarked watercraft, naval utility helicopters, and Army battlefield helicopters, and provision of medical facilities.

Air Power and Amphibious Operations WWII

The relationship between sea power and air power was key to the Allied campaign in the South West Pacific in WWII. General Douglas MacArthur determined that airfields were the tactical centres of gravity and operational decisive points. He could control the sea only if he could control the airfields. He could control the airfields only if he could take and hold the land on which they stood. He could do this only if he could control the sea. When Allied forces faced the Japanese 17th Army in well-prepared defensive positions on Rabaul they did not assault the island. Instead, the Allies took a number of nearby areas from the sea, often against little or no opposition, and established air bases. The Allied aircraft then gained temporary local air superiority to allow further amphibious landings in the Admiralty Islands, completely isolating Rabaul. After that the Rabaul-based Japanese quickly ran out of fuel and became as irrelevant as if they had been overrun, but at a fraction of the human and materiel cost.

CONSTABULARY TASKS

In addition to their primary military functions, RAN amphibious ships can also contribute to a range of constabulary tasks.

Border Protection

Amphibious ships have contributed to the prevention of illegal immigration, by transporting detainees from initial holding points to detention centres in participating regional countries. They also have the potential to act as command and control and support ships to smaller patrol vessels engaged in border protection operations.

Peace Operations

RAN amphibious ships have contributed in recent years to ADF and coalition peacekeeping and peace building operations in Bougainville, East Timor and the Solomon Islands, by providing a stabilising presence and a neutral platform for the negotiation of cease-fires. They have also provided ongoing logistic support to peacekeeping and peace-monitoring personnel engaged in these operations. During Operation Anode HMAS *Manoora (II)* acted as a mobile headquarters, airfield, hospital, hotel, stores complex and landing craft operating base. The ability to fill these roles in support of constabulary operations is intrinsic to the design of amphibious ships.

DIPLOMATIC TASKS

The RAN's amphibious ships also contribute to a range of diplomatic tasks.

Defence Assistance to the Civil Community

Amphibious units, due to their command and control, and lift capabilities, can provide substantial support to search and rescue, and disaster relief operations in Australia and the wider region. In the same way that they can deliver military impact at a point of the commander's choosing, so they can deliver disaster relief at the point of need. Devastated infrastructure that constrains aircraft and conventional ships presents no obstacle to an amphibious force. Organic helicopters can reach isolated settlements inland while organic landing craft or hovercraft can deliver large volumes of construction equipment and supplies across a beach.

Operation Sumatra Assist – Banda Aceh January – March 2005

The tsunami that struck the Indian Ocean on Boxing Day 2004 destroyed many communities. With 48 hours notice HMAS *Kanimbla (II)* sailed to provide humanitarian relief to the victims in the Banda Aceh region in Indonesia as part of Operation Sumatra Assist. The tsunami destroyed the shoreline and port facilities so Navy hydrographers and the Australian Army amphibious beach team needed to locate a suitable beach-landing site for the embarked LCM8s. Army engineers were put ashore with their earth moving equipment in spite of these difficulties. *Kanimbla* continued to provide fresh water and meals to those ashore, the organic Sea King helicopters flew humanitarian missions, while the ship's medical facility was also available. The ship also provided a safe haven for personnel to rest and recover from the work ashore.

Non Combatant Evacuation Operations

Amphibious ships and units have the capacity to evacuate Australian and approved foreign nationals during regional crises. Utilising helicopters and landing craft, and with troops embarked, they can remain in safety while civilians are brought aboard and processed, before removing them to Australia.

Non-Combatant Evacuation – Solomon Islands

When disorder in the Solomon Islands peaked in May 2000 the heavy lift ship HMAS *Tobruk (II)* was despatched to evacuate Australian and approved foreign nationals. After completing this task the ship subsequently returned as part of Operation Plumbob to provide support to cease-fire negotiations, and also Operation Trek, the ongoing peace monitoring operations.

LIMITATIONS

The combined Australian amphibious force can carry a light combined-arms Battalion Group of about 1000 personnel together with their vehicles, heavy equipment and stores. This is a significant force for constabulary and diplomatic tasks but too small to fight major military engagements. As well as being constrained by its light combat weight the existing force has limited agility.

Both ship classes must anchor and crane their landing craft over the side. Landing craft must then manoeuvre into position against the ship's stern ramp or under its crane. These methods are very slow by modern standards and depend on calm seas. The ADF has determined that the future amphibious force must be able to operate in much more

demanding conditions by day and night. New generation amphibious ships will employ floodable docks that provide a sheltered environment for the landing craft to embark and disembark their loads. This will allow the landing craft to load and launch much more quickly in far rougher seas.

The self-protection of the existing amphibious ships is very limited, and the current lack of a surface combatant capable of providing area air defence means that an amphibious task force operating in a higher air threat environment would be facing significant risk. Additionally, the limited armament makes these large vessels vulnerable to attack from small gun and missile-armed fast attack vessels, particularly in complex littoral waters. During the design phase of future amphibious vessels, consideration will need to be given to the types of sensor and weapons packages necessary to provide a higher degree of self-protection capability. The introduction of the Air Warfare Destroyers (AWD) will also provide an additional degree of protection from air, surface and sub-surface threats.

Neither existing class of amphibious ship has an air control radar and this limits the visibility conditions in which they can safely conduct helicopter operations. Army Blackhawk helicopters are not designed for maritime operations and are relatively slow to prepare for flying and subsequent stowage, requiring rotor blades to be attached and detached. These aircraft are also not designed to withstand the corrosive salt-water atmosphere encountered at sea. The newly ordered Army MRH-90 helicopter is designed to operate from ships and will be much quicker to prepare for flying and stowage. Combined with greater seating capacity, the new force will be able to deliver approximately five times as many troops per wave, and also deliver the waves much more quickly, in a greater variety of weather conditions.

Amphibious vessels such as HMAS *Tobruk (II)* and the LCH are economical in personnel and capable of carrying large items and tonnages too bulky for other transport means, but their slow speed limits the tempo of operations and increases their vulnerability to hostile action.

Larger multi-spot flight decks would allow the launch of larger waves of helicopters, putting more combat weight on the ground at a time. They would also improve the sortie generation rate and allow operations in poorer weather and lower visibility.

AFLOAT SUPPORT

10

- The support ships of the RAN are force multipliers, increasing the Australian Defence Force's maritime capability by keeping combatant ships at sea for longer periods and allowing them to operate at greater ranges from port.

HISTORY

The history of afloat support in the RAN extends back as far as the beginning of WWI, when civilian colliers and freighters were chartered to support the Australian Naval and Military Expeditionary Force operation against German New Guinea in late 1914. Subsequently, the fleet oiler HMAS *Kurumba* was ordered for the RAN, operating with the Royal Navy from 1917 until 1919, after which it was transferred to RAN service. *Kurumba* was paid off into reserve in 1928, but recommissioned in 1939 and remained with the fleet until 1948. The fleet collier HMAS *Biloela* served from 1920 until 1927, when the disposal of the remaining coal-burning RAN warships made the vessel surplus to requirements.

During WWII the RAN requisitioned a number of auxiliary oilers to support the fleet, and then served in the South West Pacific under the United States 7th Fleet, including as part of the support force for operations such as the invasion of Leyte Gulf. Numerous smaller vessels provided logistic and technical support to RAN ships in forward areas.

There was a hiatus in afloat support until the early 1960s when the Australian government began to place a high priority on the provision of effective mobility to Australian forces. The fleet oiler HMAS *Supply* subsequently entered service in 1962. The escort maintenance ship HMAS *Stalwart (II)* entered service in 1968 and served until 1990. The largest naval vessel ever designed and built in Australia, *Stalwart* was intended to carry technicians and workshops to service and repair warships away from major ports and bases.

> Our ships sailed on water, but they moved on oil, and the demand never ceased.
>
> Rear Admiral W. R. Carter, USN
> Commander, Service Squadron Ten, 1942-45

The underway replenishment ship HMAS *Success (II)* entered service in 1986 to replace HMAS *Supply*, which had been removed from service in 1985. The fleet oiler HMAS *Westralia (II)* entered RAN service in 1989 to provide an additional capability, particularly with the decision to develop a two-ocean navy. The ex commercial tanker MV *Delos* has been purchased and will be modified to meet RAN requirements prior to its planned introduction into service as HMAS *Sirius* during 2006.

OPERATIONAL ENVIRONMENT

To achieve government goals, maritime operations are expected in both the littoral and open-ocean environments with large climatic range remote from Australia. Surface combatants and our amphibious ships routinely operate over a vast area of the globe to achieve these goals. The afloat support force enables the surface combatants and amphibious forces to operate with more flexibility and at greater range from their operating ports by increasing time at sea and reducing dependence on port visits to obtain the necessary logistic support. Given Australia's long coastlines, the dispersed archipelagic and regional island nations that surround it, sparse infrastructure and minimal options for forward operating bases, afloat support empowers the Australian Defence Force (ADF) to conduct maritime operations throughout Australia's area of interest.

CAPABILITY

The current RAN afloat support force consists of one replenishment vessel and one fleet oiler.

The replenishment vessel, HMAS *Success (II)*, is a multi-purpose support ship capable of providing fuel, water, ammunition, stores and fresh and frozen foodstuffs to receiving ships or units at anchor or while underway. *Success* can carry a SK50A Sea King utility helicopter to assist with the transfer of stores and personnel. *Success* has a gross registered tonnage of 10,755 and is capable of carrying 9,962 tonnes of useable diesel fuel (5,000 only issuable to customer units, 1,175 tonnes of aviation fuel and 140 tonnes of water). She also has capacity for more than 350 cubic metres of victuals, 800 cubic metres for munitions including missiles and torpedoes, and 184 cubic metres of

general stores and spares. In terms of diesel fuel, 5,000 tonnes equates to about six complete FFG refuels or eight FFH refuels; while 1,175 tonnes of aviation fuel equates to approximately 150 F/A-18 Hornet refuels.

The fleet oiler, HMAS *Westralia (II)*, is primarily configured to provide fuel and water, has limited capacity for the carriage of food and stores, and no capacity to carry cargo ammunition. *Westralia* has no hangar, and cannot carry a helicopter, but does have a helicopter deck and can thus transfer solids and personnel using helicopters provided by the customer ship or unit. *Westralia* is a strategic fuel transfer resource, which is capable of carrying more than 25,000 tonnes of diesel fuel, 4,700 tonnes of aviation fuel and 1,400 tonnes of water. This equates to about 30 FFG refuels or 42 FFH refuels, plus 600 F/A-18 Hornet refuels.

Both *Success* and *Westralia* are single-hulled ships. Increasing international concern over marine pollution arising from tanker accidents and groundings has resulted in changes to regulations sponsored by the International Maritime Organisation (IMO), including the introduction of an accelerated timetable for the phase out of single-hulled tankers. The RAN is not bound by IMO regulations, however, as a responsible government organisation it is obliged to comply with the IMO regulations to a degree that is reasonable and practicable taking into account its military imperatives. The changeover to an IMO compliant afloat support force will commence with the replacement of HMAS *Westralia (II)* by a civilian double-hulled tanker converted for underway replenishment. The replacement tanker, which will provide a similar capability to *Westralia*, will be named HMAS *Sirius* in memory of the flagship that led the First Fleet in 1788. HMAS *Sirius* has the potential to carry approximately 40,000 tonnes of diesel fuel and hence will act as a more effective force multiplier for RAN surface combatants. In the future, HMAS *Success (II)* will also be replaced with a purpose built double-hulled vessel capable of replenishing ammunition in addition to fuel, water and military stores.

MILITARY TASKS

Logistic Support

The primarily contribution of the afloat support force is the delivery of logistic support to surface combatants and other units while they conduct combat operations at and from the sea. The effectiveness of warships is enhanced by providing logistic resupply in the area of operations. Support vessels can provide fuel, water, ammunition, rations, stores and personnel for the combatant force and can transfer these key logistics elements while the surface combatants remain on operations and ready for combat at short

notice. The afloat support assets provide a significant enhancement to the performance of RAN surface combatants and amphibious forces by extending their range and endurance and thus their availability for operations, as shown below.

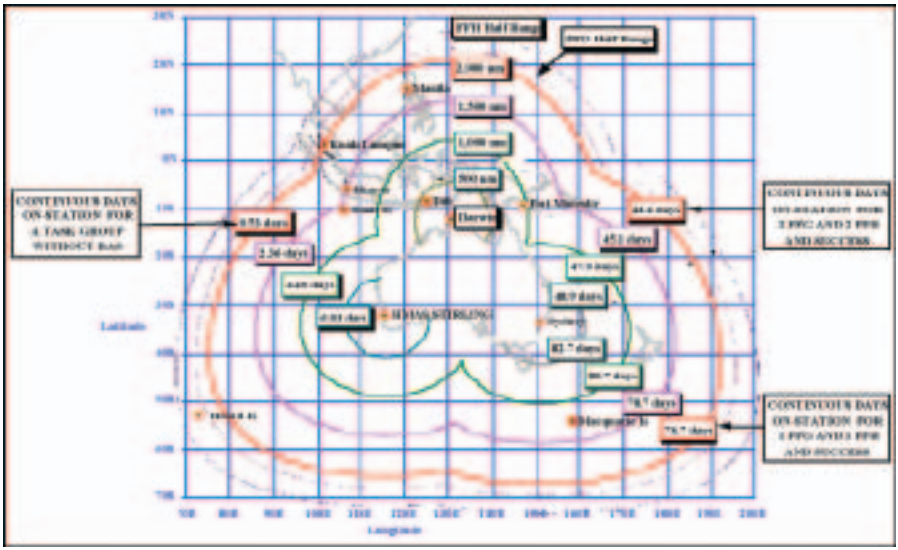


Diagram of Extended Range and Endurance for Surface Combatants with Afloat Support

The operational situation may require the provision of a dedicated replenishment vessel to a naval task group. Multi-role replenishment vessels are optimised for this role due to their higher speed, diversity of cargo and capacity for 24-hour underway replenishment at sea (RAS) operations.

Underway replenishment can be conducted at sea using special purpose transfer rigs for bulk liquids and solids or using helicopters and boats in the case of personnel and smaller cargoes. The combination of these methods can be adjusted and tailored to meet the specific operational circumstances and to minimise any disruption to the combat readiness of the customer vessel.

The loss of replenishment vessels through combat action would seriously impact on the effectiveness of RAN operations. Replenishment vessels are optimised for the carriage of their fuel and stores cargoes and their upper deck spaces are devoted to the machinery and rigs which allow the transfer of these cargoes while underway at sea. As a consequence these vessels are generally lightly armed and are not fitted with the same range of powerful sensors and weapons that are carried by surface combatants. This makes them vulnerable to hostile action, and they require protection in high-threat environments. The appropriate allocation of combat effort to provide protection and escort of these vessels is a key consideration for operational commanders.

During RAS, the receiving and supplying vessels are constrained in their ability to employ their weapons and sensors and to manoeuvre. The design of replenishment vessels and the procedure for transfer of cargoes are shaped to reduce the time taken to conduct replenishment and minimise the time when the vessels are vulnerable. Specialised military replenishment vessels are the preferred option for naval operations, as civilian tankers chartered or taken up from trade are not optimised for military operations.

Size is also a factor. Larger replenishment vessels are better able to provide support to major combatant ships such as destroyers and frigates. Smaller vessels are more appropriate for medium to small sized ships such as landing craft and patrol boats.

Maritime Power Projection

Afloat support ships are also capable of supporting all other RAN vessels and units, as well as Army and Air Force facilities and units ashore. Maintenance of the logistic base at sea reduces the requirement for vulnerable fixed or temporary depots on shore and the associated need for supporting troops to operate and guard them. The use of afloat support vessels in this manner is expected to grow over time as the ADF increases its expeditionary capability. Other supporting vessels can be expected to be employed on resupply missions to move bulk supplies into theatre and from one patrol station to another. This type of tasking is more appropriate for a non-specialised tanker or commercial vessels chartered for government service, due to the scarcity of multi-role military replenishment vessels.

CONSTABULARY AND DIPLOMATIC TASKS

ADF overseas presence promotes Australia's national influence and access. The afloat support force is clearly recognised as contributing to Australia's maritime power. Their port visits, both alone and in company with surface combatants, are highly visible and send a powerful signal to the political leaders of nations or regimes.

Afloat support force vessels are lightly armed and their presence generates a less overt manifestation of combat power. This gives government a range of options, and the use of afloat support vessels can allow the sustainment of a national presence in sensitive situations when the more threatening appearance of a surface combatant or amphibious vessel is not appropriate.

As with all naval vessels, the afloat support force is readily available to deploy at short notice to assist with disaster relief and with evacuation of nationals. The afloat support vessels can also contribute to surveillance operations and to search and rescue.

In any event the stores and provisions for the supply of the fleet should be kept afloat, and to provide for other exigencies a few large armed transports would afford great resource.

Lord St. Vincent
Memorandum to First Lord of the Admiralty, 1795

SUBMARINES

11

- Due to their stealth, long-range endurance, formidable striking power, and advanced intelligence-gathering capabilities, submarines are a valuable component of the RAN.
- These inherent characteristics mean that modern submarines will normally have limited utility in the constabulary and benign diplomatic roles, but they are increasingly useful as the degree of coercion increases.
- Australia's *Collins* class submarines are highly capable strategic assets, but will require a carefully planned, ongoing capability enhancement to remain viable in the face of advances in regional submarine and anti-submarine technology.

The advent of submarines and aircraft in the early part of the 20th century altered the technological balance of sea power. With their inherent stealth and deadly striking power, submarines had a significant impact on maritime warfare during both world wars. Indeed, the success of the German U-boat campaigns came close to strangling the British war effort, while the relentless Allied submarine campaign against Japan contributed substantially to the eventual victory in the Pacific. The advent of nuclear power, submarine-launched ballistic and cruise missiles, and the need for ever increasing levels of stealth during the Cold War, saw the roles of anti-submarine warfare (ASW) and intelligence, surveillance and reconnaissance become drivers of submarine technology.

HISTORY

As part of its plan for a balanced Fleet Unit, in 1910 the Australian government ordered two 'E' class submarines, with the expectation that additional orders would be placed for a flotilla of six. Commissioned in Britain in February 1914, HMAS *AE1* and HMAS *AE2* established a world record for the longest voyage yet made by submarines when they completed their journey to Australia. Both later participated in Australia's first military campaign in German New Guinea, where *AE1* was lost with all hands due to unknown causes – the first RAN unit lost in action and the first Allied submarine loss of WWI. *AE2*

achieved international fame on 25 April 1915, the day of the Gallipoli landings, when she forced her way through the Dardanelles, a passage previously thought impossible, and torpedoed the large Turkish gunboat *Peyk I Sevket*. Five days later *AE2* was damaged by the Turkish torpedo boat *Sultanhisar* during her patrol in the Sea of Marmara and forced to scuttle.

Submarine Operations in the Gallipoli Campaign

Allied submarine operations in the Sea of Marmara between 1915-16 were one of the most successful aspects of the whole Allied campaign on the Gallipoli peninsula. The feats of the British and French submarines that penetrated the Dardanelles in *AE2's* wake became legendary. The campaign against Turkish shipping created havoc on their supply lines to the rugged peninsula, because poor road and rail access dictated heavy reliance by the Turks on sea supplies.

After WWI the RAN briefly commissioned five 'J' class submarines between 1919 and 1922, but these war-weary vessels proved unreliable and were subsequently removed from service as an economy measure. The submarines HMAS *Oxley* and HMAS *Otway* were operated between 1927 and 1930; however, they were then transferred to the Royal Navy (RN) due to further financial cutbacks. During WWII the Dutch submarine *K9* operated briefly in the RAN for anti-submarine warfare training purposes and a number of Australian naval personnel served with distinction in RN fleet submarines and midget submarines. RN and United States Navy (USN) submarines operated out of Australian bases, primarily Fremantle and Brisbane, during the Pacific War, and contributed significantly to the destruction of Japanese shipping. RN submarines were subsequently stationed in Sydney from 1949 to 1975 to assist with RAN anti-submarine warfare training.

The current Australian submarine force began with the arrival of HMAS *Oxley (II)* and the establishment of the First Australian Submarine Squadron in Sydney on 18 August 1967. Another five *Oberon* Class submarines subsequently entered RAN service, and over three decades of service enabled the development of a highly professional submarine force that earned international respect.

The *Collins* project, which was initiated in the early 1980s to provide an Australian-built submarine to replace the aging *Oberon* class, was a significant Australian industrial achievement, which delivered six modern conventional submarines into RAN service from 1996.

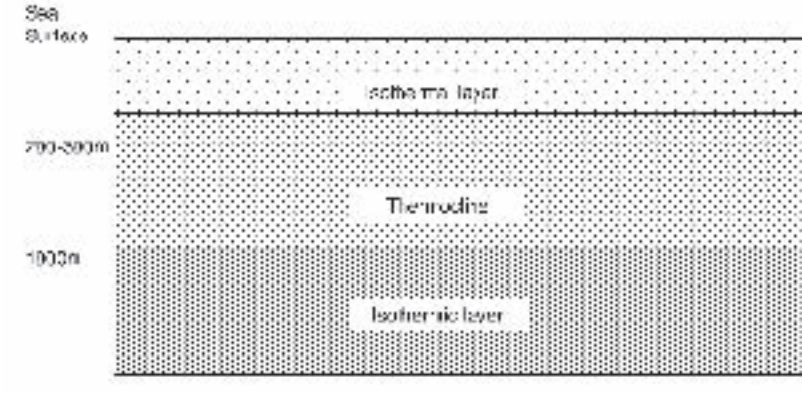
OPERATIONAL ENVIRONMENT

The Undersea Environment

The undersea environment is a complex world of constant interplay between the physical laws governing thermodynamics, gases, fluids, and chemistry. The pressure in seawater increases by one atmosphere with every 10 metres of depth – in simple terms, at 100 metres a person would weigh ten times as much as at the surface of the ocean. This pressure, combined with the almost total absence of light, creates a harsh operating environment, and predicting the behaviour of physical properties within this environment is an ongoing challenge.

Due to the relative inability of transmissions in the optical, thermal or electromagnetic spectrums to penetrate the sea, sound is the main source of information beneath the surface. Water is a relatively good transmitter of acoustic energy, and sound may travel for thousands of kilometres, but predicting how and in which direction it will do so, is extremely difficult. Animal, human and geological activity in the oceans creates a range of conflicting sounds. The nature of the seabed and the response of water molecules to pressure, temperature and movement affect how sound moves. A detailed understanding of the underwater environment and the submarine's own noise are critical factors in remaining undetected.

Although salinity is usually fairly constant in a given area, and pressure follows an evenly increasing gradient with depth, the temperature of the water column from surface to the seabed is subject to many fluctuations. This creates three main temperature layers, as shown below.



Oceanic Temperature Layers

The boundaries between these various acoustic layers are the biggest factor contributing to the unpredictable acoustic environment. Sound waves may penetrate layers, skip off denser layers, or do both, according to many variables. The boundaries vary from area to area in the oceans, while eddies from warm or cold currents, or around seabed features, also affect the behaviour of sound. The effect of all these interactions is to create shadow areas where a submarine may hide, because the conditions prevent its own noise from travelling far, or prevent active sonar transmissions penetrating the shadow area.

The environmental complexities make a submarine an elusive quarry in the deep ocean. Shallow water also presents a difficult environment in which to detect and attack submarines, due to high background noise, changeable bottom types, widely varying water conditions, and high shipping traffic.

However, in addition to sound, there are other methods of detecting submarines. Interception of radio transmissions, plus visual, infra-red and radar detection of masts and periscopes remain important, and all modern anti-submarine forces rely on a combination of these methods to counter submarines. The submariner must, therefore, be constantly aware of not just the acoustic signature of the submarine, but also of its thermal, electromagnetic, chemical, magnetic and hydrodynamic signatures. Today, the key to effective use of sensors by or against submarines lies in a scientific knowledge of the environment, and the ability to rapidly process, synthesise, interpret and display huge volumes of complex data.

The Military Environment

Submarines operating in the littoral are inherently much less vulnerable than surface and air forces, and may thus play an important role in penetrating the sphere of influence of an adversary as discussed in Chapters 6 and 10 of *Australian Maritime Doctrine* (AMD). They have the potential to produce strategic effects with special forces, can access remote theatres and remain on station for long periods, ready to commence offensive operations whilst peaceful means of resolving conflict run their course.

Early in a maritime campaign it is likely that submarines will be operating in a forward-deployed, independent role, reporting developments and determining opponent capabilities. However, at a later stage closer integration with surface forces will likely be required. This will be of particular importance during: shaping operations in distant support of a maritime campaign; the coordination of special forces operations; co-ordinated anti-submarine or anti-surface warfare; mine laying or countermeasures operations; the provision of indicators and warnings and other types of intelligence, surveillance and reconnaissance missions.

Submarine Operations in the Pacific during WWII

A comparison between the submarine operations of the USN and the Japanese Navy during WWII provides insights into effective and ineffective employment of the weapon. The USN launched a highly successful anti-shipping campaign against the Japanese immediately after the attack on Pearl Harbour, which had a severe impact on supplies for the Japanese war effort. Conversely, despite a large and modern submarine force, the Japanese did not press home an effective anti-shipping campaign against the Allies dependence on sea lines of communication for the progress of the Pacific Campaign. Whilst the reach of raids such as the midget-submarine attack in Sydney Harbour were impressive, results were relatively insignificant. Preoccupation with the decisive fleet action, an unsuccessful focus on sinking major warships, and their diversion to providing supplies to isolated land garrisons meant that Japanese submarines had little strategic influence on the war's progress.

The submarine is an excellent collector of information, but high data rate communications are required across frequency ranges and media - electromagnetic, optical and/or acoustic - to minimise the risk of counter-detection. Flexible combat systems are required to synthesise external intelligence with the submarine's own sensor data.

An appropriate response to that information is defined by the platform and system capabilities such as range, speed, endurance, sensors and weapons:

- Preparing the submarine for new tasking may require changing torpedo tube contents, charging batteries prior to an engagement, planning searches or littoral operations, and crew briefings. Like any unit, advanced warning will enable the submarine to better prepare for any new mission and enhance the likelihood of success;

- The inability of electromagnetic radiation to penetrate far beneath the sea surface and the submarine's need to remain covert necessitate careful vetting and management of message traffic to ensure timely receipt. The use of Very Low Frequency transmissions, which can be received below the sea surface, ensures receipt of important communications, while High Frequency and Ultra High Frequency satellite transmissions with their higher data rates provide the capacity for greater volume when aerials can be exposed; and

- In the future higher data rate communications, commercial communications protocols, duplex (simultaneous transmit/receive) systems, as well as towed and directional antennae should reduce the time of exposure of a submarine's masts.

Submarines add most value when deployed early in any expeditionary campaign, where they will play a key role in advance of amphibious forces, shaping the above water and undersea battlespace. With an advanced environmental sensor package, they can monitor and report oceanographic conditions in their operating area, contributing to rapid environmental assessment (REA) of the chosen area of interest. They can also sanitise the area to locate and identify all contacts, monitor enemy activity and patterns of maritime traffic, and contribute to advanced mine countermeasures and covert beach reconnaissance operations.

Part of this role may also see submarines deploy special forces to conduct shaping operations ashore. In this event, the submarine will maintain communications with the special forces, continuing to support them through provision of tactical intelligence from own or third-party sensors, and if necessary, re-supply or extraction.

The proliferation of new submarine technology in the region is matched by the acquisition programs for new submarines. Currently at least ten countries in the region have submarine construction or procurement programs underway and there are over 240 operational submarines in service in Australia's area of interest.

Like the destroyer, the submarine has created its own type of officer and man – with language and traditions apart from the rest of the Service, and yet at heart unchangingly of the Service.

Rudyard Kipling
The Fringes of the Fleet, 1915

CAPABILITY

The *Collins* Class Submarines

The *Collins* class submarines are excellent anti-surface warfare platforms able to strike from over the horizon with Harpoon anti-shipping missiles, using either their own sensors or third party information, or with powerful Mk 48 torpedoes at closer range. With their stealth, powerful sensors and an ability to loiter in an opponent's operating areas for weeks on end, they are the most capable anti-submarine platform in the ADF, with the ability to neutralise submarine threats thousands of miles from any Australian base. The introduction of the Mk 48 Mod 7 (ADCAP) torpedo will provide an enhanced capability in littoral waters as well as the open-ocean.

The *Collins* class submarines are also potent surveillance and reconnaissance assets, and can be used in an intelligence role or to provide indications and warnings from close by the source of a threat, such as an airfield or harbour. Submarines provide the most clandestine means of inserting and extracting special forces, either fully dived in the highest threat environment or using 'float on/float off' techniques for dinghies by briefly surfacing in lower-threat environments.

The most significant tactical constraint of the diesel-electric submarine is the requirement to expose masts above the surface of the water in order to recharge batteries. Careful management of battery charging is required to reduce the risk of counter detection by passive acoustics, radar, infra-red or optical means. While the *Collins* class submarines, with their good indiscretion rate enjoy a comparative advantage over most existing classes of diesel-electric submarine, the introduction of submarines with air independent propulsion systems is gathering pace. Depending on the technological options selected, such systems may reduce the recharging requirement from once per day to once every fourteen days. This is likely to represent a significant change in conventional submarine capability in the next 5-10 years.

The 1982 Falklands War

Submarines had a profound effect on the 1982 Falklands War. British operational deception caused the Argentinians to believe that there were nuclear submarines on station well before they actually arrived in theatre. Conversely, the threat posed by the two operational Argentine Type 209 submarines was a constant concern to the RN task force, one of NATO's most effective ASW groups, although no successful attack on the task force was recorded. The sinking of the Argentine cruiser *General Belgrano* outside the declared Total Exclusion Zone by the nuclear-powered attack submarine HMS *Conquerer* had a powerful deterrent effect. Not only did this action remove one arm of an apparent pincer movement against the British surface forces, it also prompted the Argentine aircraft carrier *25 de Mayo* to return to port the next day where it remained for the duration of the conflict. The sinking of the *General Belgrano* virtually removed the Argentine surface naval threat, and forced the Argentine command to rely largely on land-based air power and submarines to challenge British sea control for the remainder of the campaign. Later in the campaign British submarines were used to provide intelligence warning from close to the Argentine mainland airbases. When the slower conventional submarines arrived in theatre, HMS *Onyx* was used to insert special forces teams and HMS *Osiris* was used to lay mines.

The *Collins* class submarines have set a benchmark for conventional submarine capability. They are powerful instruments of policy, and guarantors of national security. However, a review of regional submarine developments makes it clear that maintaining their superiority will require continued work. Submarines are strategic assets, vital elements of a maritime nation's ability to project power beyond its shores. As such, they must be able to confidently enter an adversary's battlespace, secure in the knowledge that they can deal with the most able units available to that adversary.

The RAN has embarked upon a carefully planned process of capability enhancement for the *Collins* class, encompassing all aspects of submarine capability in a twenty-year program. The aim is to ensure that Australia maintains the viability of its submarines in the face of regional capability advances, while also remaining abreast of new technology, not just in its scientific research, but in relation to industrial capacity also.

MILITARY TASKS

The submarine's military contribution includes the following tasks:

- intelligence collection and surveillance;
- maritime strike and interdiction;
- barrier operations;
- advanced force operations;
- layered defence;
- interdiction of shipping;
- containment by distraction; and
- support to operations on land.

Rather than focus on these tasks as discrete elements of capability, the ADF considers that submarines provide a variety of military options at various stages of a campaign. Specific tasks may shift from day-to-day, according to where the operational commander sees the available submarines providing the best input to the overall campaign.

The eight stages of a campaign as described in Chapter 11 of AMD are strategic in nature. Submarines are capable of supporting all of these phases with their varying tasks, ranging from training during the identification of crisis or force generation phase, through surveillance/precursor missions during the deployment or early stages of sea control phase, to combat operations during the sea control or power projection phase. Their utility as covert surveillance platforms and their ability to survive in the enemy's own littoral waters makes submarines a strategic asset during any maritime campaign. With different tasking, submarines are a capable anti-shipping and anti-submarine asset and their presence in an area is a strong deterrent to hostile action against friendly forces. AMD emphasises in Chapter 11 the fluidity of campaign planning, while the government's policy paper *Defence 2000: Our Future Defence Force*, notes that over the next decade we can be reasonably sure that it will consider utilising the ADF in circumstances that we have not yet envisaged. Submarines are capable of contributing great flexibility and firepower to a maritime campaign. Provided they are used with full appreciation of their characteristics and requirements, submarines offer much to those engaged in the planning and conduct of maritime operations.

Tempo

AMD also states on p.112 that to achieve a high campaign tempo, operational commanders must devolve decision-making and allow their subordinates freedom of action. A key driver of tempo is the number of available units. The size of the RAN submarine force allows for two submarines to be deployed and on station at any one time at a significant distance from Australia, with the possibility of another submarine in transit to or from station. The ability to mobilise resources to temporarily surge three or more submarines to theatre can probably be achieved only for a short period of time. By having this capacity, potential adversaries are faced with the prospect of finding and neutralising two or more submarines. Additional numbers complicates the task, creates greater uncertainty, places more demands on anti-submarine resources, and constrains military options. The relatively slow transit speeds of conventional submarines compared to surface ships must be taken into account, as well as the reduction in speed required to achieve the stealth necessary for covert access.

Sustainability

Sustainability of the platform in theatre can be extended by periodic withdrawal to a forward support area for crew rest, defect repair and the replenishment of fresh provisions, fuel, stores and weapons.

The weapon mix is difficult to change once a submarine has left base port. Careful consideration of the likely tasking will be necessary well in advance. A mission-specific mix of missiles and torpedoes, and some trade-offs will be necessary to accommodate extra stores, personnel and special forces teams and their equipment.

CONSTABULARY AND DIPLOMATIC TASKS

The modern submarine generally has limited utility in undertaking constabulary and benign diplomatic tasks, due to its limited cargo and passenger capacity, poor surfaced seakeeping ability, and armament which is optimised for high-end warfighting. However, as the degree of coercion increases, so does the utility of the submarine.

PATROL BOATS

12

- Patrol boats are limited in their warfighting capability by their small size, reduced seakeeping ability, fewer crew numbers and restricted armament.
- Despite these limitations, patrol boats are capable independent units, particularly in choke points, estuaries and other shallow waters where larger units may be restricted in their operations.
- Patrol boats contribute to the enforcement of Australian legislation within its maritime domain, by maintaining Australia's sovereignty, and preventing illegal immigration, fishing and smuggling.

HISTORY

Maritime patrol operations have a long history in Australian waters, dating back to the 19th century when sloops and gunboats operated in the navies of the Australian colonies. After the outbreak of WWI the RAN requisitioned many civilian vessels to undertake harbour and coastal patrol duties. Following the war, coastal patrol duties devolved upon larger vessels such as sloops, destroyers and cruisers.

A large number of yachts were taken up from civilian use in the early months of WWII to be armed and employed by the RAN as examination ships, pilot boats and for river and coast protection patrols. A more conventional capability lay in the Harbour Defence Motor Launches and *Fairmile* B-type Motor Launches that entered service from October 1942. These vessels were employed on routine patrols, convoy escorts, running special forces in and out of Japanese-held areas, boom defence patrols in harbours at home and abroad, courier operations, survey work, and raiding Japanese-held coasts.

The motor launches quickly passed out of service after the war and coastal patrol duties once more devolved upon larger RAN ships. From the early 1960s the Ton class minesweepers took on significant patrol responsibilities, particularly during the Indonesian Confrontation from 1962-1966. This experience led directly to the decision to reintroduce patrol boats to the RAN inventory, as the minesweepers were expensive to maintain and their engines were not designed to loiter on patrol.

In 1965, twenty *Attack* class patrol boats were ordered, fifteen for the RAN and five for the Papua New Guinea Division of the RAN. With the end of the Indonesian Confrontation in 1966, these patrol boats were directed to the new task of coastal surveillance, coinciding with the declaration of the 12nm Australian Fishing Zone in 1967. These small vessels provided sterling support to Australia's broader national security agenda, including intercepting illegal fishing vessels and illegal immigrant vessels after the end of the Vietnam War.

Experience proved that the *Attack* class vessels were too small for long-range patrol tasks away from their bases. In 1976, fifteen larger *Fremantle* class patrol boats (FCPBs) were ordered, entering service from 1980 to 1984. The FCPBs have been at the forefront of surveillance and patrol operations for the last 20 years, undertaking duties to counter infringements of fisheries, customs, immigration and anti-drug legislation. They also contributed to the protection of the Bass Strait oil rigs from 1980 until the early 1990s. The patrol boats have been supplemented in recent years by frigates, minehunters and survey vessels, which have also conducted patrol activities in support of broader national security policies.

A project to replace the FCPBs with a larger, more capable Offshore Patrol Vessel was terminated in 1998, and replaced with a more conventional program to build the similar, but more capable *Armidale* class patrol boat (ACPB).

OPERATIONAL ENVIRONMENT

During peacetime, patrol boats primarily contribute to Australia's domestic civil surveillance, interdiction and legislative enforcement operations. These operations occur within Australian maritime zones adjacent to the Australian mainland, and around Australia's island territories, as detailed in Chapter 2.

Most incursions into Australia's exclusive economic zone (EEZ) occur in the north, but there are also incursions by larger fishing vessels into the Southern Ocean fishing zones around Heard and McDonald Islands. While the patrol boats are theoretically required to patrol the entire Australian coast and EEZ, the practical limitations on their range, crew size, living conditions and seakeeping abilities makes them best suited to northern operations.

Although the FCPBs did in the past conduct patrols of the Bass Strait and the southeast and southwest coasts, they are not capable of transiting to patrol the EEZ surrounding Heard, McDonald or Macquarie Islands. In recognition of this fact, and in response to increased illegal activity within the northern area of operations, the patrol boats based in Sydney and HMAS *Stirling* were moved to Darwin in 2002. All patrol boats have since been based in Darwin and Cairns, close to their major operational areas. Any incursions

into the EEZ are assigned to the nearest patrol boat base, unless a surface combatant happens to be within closer range.

Patrol boats also train to operate within a larger force, alongside major surface combatants and to provide a self-contained maritime interception, intelligence and warning capability. Their size and draught provide a capability without the higher cost of a major surface combatant. Patrol boats train at regular intervals with regional and allied navies, and may be easily deployed for overseas operational duties as part of a larger conventional task force.

Patrol boats participate in a number of regional, bilateral and multilateral exercises primarily within South East Asia and the South West Pacific. During these deployments patrol boats conduct port visits in support of diplomatic and defence ties. Of particular note is the participation of FCPBs in Operation Anode in the Solomon Islands. Australia also committed personnel to assist with the training of Iraqi Navy personnel in patrol boat operations after the 2003 Iraq War, as part of Operation Catalyst.

CAPABILITY

Although patrol boats are limited in their warfighting capability by their small size, limited seakeeping and restricted armament, the fact that their crews are drawn from across the spectrum of RAN ships and units means they are capable of operating as part of a larger naval task force. As such, patrol boats should not just be considered maritime constabulary platforms. The RAN patrol boat force provides Australia's primary surface asset in support of civil law enforcement and coastal surveillance operations, and provides 1800 patrol days per annum to the Coastwatch-coordinated Civil Surveillance Program.

Patrol boats are a cost effective, surface surveillance asset. These platforms are capable of surface surveillance and interdiction, support to land forces and of conducting concurrent multiple boardings for limited periods in a low-threat environment. With a draft of around 2.5 metres, patrol boats are capable of operating within many of the littoral regions around Australia's coastline and within Australia's region. Patrol boats can provide an electronic surveillance capability, in addition to providing intelligence and warning as required.

Consistent with the growing importance of constabulary operations as a principal tasking of modern naval forces, patrol boats represent a lower cost alternative for the projection of national power. Specifically, during low threat scenarios, patrol boats can be useful in regional situations where Australia does not wish to escalate diplomatic tension.

Fremantle Class Patrol Boats

The fifteen FCPBs entered service from 1980. Although larger and having a longer range then their predecessors, they are limited in their seakeeping ability, their armament is a WWII vintage unstablised 40mm Bofors gun, and their sensor suite is a commercial standard navigation radar. Despite their limited warfighting capability, they have proven to be an excellent constabulary platform in Australia's northern waters.

Armidale Class Patrol Boats

The first ACPB entered service in mid-2005. Advantages of the ACPB over its predecessors are increased range, availability, greater seakeeping qualities, improved communications and sensor systems, improved armament, and an improved boarding capability. Initial vessels will have a single crew, but later boats will employ a multi-crew cycle to increase the number of patrol days. The ACPBs improved crew employment concept may incorporate crew changeovers remote from homeport.

MILITARY TASKS

Patrol boats contribute to military operations as detailed below:

- **Intelligence Collection and Surveillance**. Patrol boats can easily transition from peacetime to combat surface surveillance. In comparison to major warships they have less capable sensors and contact reporting systems, but are capable independent units in choke points or shallow waters.

- **Interdiction of Commercial Shipping and Military Sealift**. Patrol boat crews are well trained in visit and search techniques and during tension or conflict, patrol boats may be used to interdict commercial shipping.

Patrol and Interdiction – Indonesian Confrontation, 1962-66

The importance of maritime patrol and interdiction for border security was demonstrated during the Indonesian Confrontation. A small boat containing 15 Indonesian infiltrators was briefly detected on radar but not investigated by a naval patrol vessel. The group landed on the coast of South East Johore, and two infantry battalions (approximately 1400 personnel) required six weeks to eliminate it.

- **Maritime Strike and Interdiction**. Although patrol boats lack offensive firepower, they can provide surface reporting and targeting to other assets with offensive strike capability. Such operations could see a patrol boat provide a major surface combatant, maritime strike aircraft or even a submarine with intelligence or targeting information, at some likely risk to the patrol boat.

- **Layered Defence**. Patrol boats may be used as advanced pickets to larger forces both at sea and in littoral waters and choke points.

- **Support to Land Operations**. Patrol boats are capable of inserting and extracting small land force units and providing limited logistics support to land forces.

CONSTABULARY TASKS

Patrol boats contribute to the enforcement of Australian legislation within its maritime domain, by maintaining Australia's sovereignty and denying access to unregistered fishing vessels and people trying to illegally immigrate. These operations involve patrol boats operating within the framework of domestic law and Australia's international

obligations. Patrol boats are capable of contributing to the following roles:

- **Environmental and Resource Management and Protection**. RAN patrol boats contribute to the national task of fisheries protection as part of the Coastwatch managed national surveillance effort.

Fisheries Operations

Protection of Australia's natural resources is central to the constabulary tasking of patrol boats. Resource stocks are being depleted globally creating an environment where foreign operators are prepared to proceed further afield for fishing grounds. From 1995-2004, Australian patrol boats averaged around 350 boarding operations per annum resulting in the apprehension or administrative seizure of approximately 150 vessels per annum.

- **Peace Operations**. Patrol boats can contribute to peace operations either by assisting with personnel, or conducting low-level supply operations to remote communities affected by conflict. Patrol boats may also be assigned the task of patrolling a State's maritime domain to monitor cease-fires, enforce its legislation, and to maintain law and order. However, the level of threat and the limited self-defence options afforded patrol boats must be taken into consideration.

- **Prevention of Illegal Immigration**. Patrol boats participate in national operations to prevent illegal immigration by sea.

- **Quarantine Operations**. Patrol boats assist in Australia's quarantine effort by preventing landings on Australian shores by unauthorised foreign vessels, which could if not detected inadvertently release plant, animal and human disease.

- **Defence Force Aid to Civilian Authorities**. Because of their expertise and experience in routine operations with other Australian government agencies, and an extensive knowledge of northern waters and local communities, patrol boats can provide a range of support to civil authorities.

- **Drug and Arms Interdiction**. Patrol boats can contribute to anti-smuggling operations conducted by Federal and State police agencies.

- **Anti-Piracy Operations**. Patrol boats have a limited capacity to suppress piracy observed on the high seas, or armed robbery against ships within Australia's territorial waters.

DIPLOMATIC TASKS

Patrol boats regularly conduct the following operations:

- **Defence Assistance to the Civil Community**. Particularly because of being based in Australia's north, RAN patrol boats routinely undertake a range of Defence Assistance to the Civil Community (DACC) tasks, often concurrently with their usual constabulary tasks, including:
    - launching and recovering meteorological instruments at sea;
    - biological studies of Australia's coastal reefs;
    - collection, recording and reporting of environmental data;
    - search and rescue operations; and
    - natural disaster relief.

- **Defence Force Assistance to Allied and Friendly Navies**. Patrol boats regularly conduct exercises within South East Asia and the South West Pacific. These include large-scale exercises such as the Persama series under the Five Power Defence Arrangement (FPDA), as well as smaller regional exercises with South West Pacific navies. Often the exercises with the South West Pacific navies include exercising with *Pacific* class patrol boats, provided to these countries by Australia for civil surveillance operations.

- **Presence**. RAN patrol boats are central to Australia's engagement with countries in the South West Pacific region and they deploy throughout South East Asia and the Pacific in support of Australia's strategic interests.

Participation in Operation Anode – 2003/04

Patrol boats played a significant role during the restoration of order to the Solomon Islands in 2003/04. FCPBs were deployed throughout this operation conducting patrol and response duties, participating in the confiscation of weapons, and visiting outlying islands to educate communities on the restoration of order process. After the initial restoration of order, this operation was sustained solely by minor war vessels for over 12 months.

- **Permissive and Non-Permissive Non-Combatant Evacuation Operations**. Patrol boat crews are trained to conduct low-level non-combatant evacuation operations or to assist a larger evacuation task.

LIMITATIONS

The principal limitations of patrol boats are:

- **Environmental Conditions**. Patrol boats are normally limited to operations in less than sea states 4-5, and experience difficulty in conducting boarding operations in seas exceeding 2.5 metres.

- **Range**. Fuel capacity and provisions storage limit the range of patrol boats.

- **Crew**. Most evolutions involve a significant number of the 21 to 24 personnel aboard a patrol boat. High-intensity operational periods must be interspersed with adequate opportunities for crew rest.

- **Self-protection**. The unstabilised 40mm gun of the FCPB and the stabilised 25mm gun of the ACPB provide a limited offensive and defensive capability. Despite its improvement over the older 40mm weapon, the new stabilised 25mm does not greatly increase the self-protection of patrol boats in a high-threat environment against anti-ship missiles, attack aircraft, larger warships, and submarines.

MINE WARFARE AND CLEARANCE DIVING

13

- Sea mines are a potent sea denial weapon that can be used to cause major disruptions to port approaches, choke points and focal areas, and which require a disproportionate effort to counter in comparison to their relative ease of employment.
- Australia's dependence on maritime trade highlights the need for a balanced and effective mine countermeasure force capable of dealing with a diverse range of mine types.

HISTORY

The sea mine has played an important role in naval campaigns for over two centuries. This began in 1776 with Bushnell's keg, which was filled with black powder and fired by a flintlock mechanism. Over time mine technology advanced and by WWI mines were being laid with switching mechanisms including chemical switches. Further advances in mine technology included the employment of innovations such as magnetic induction influence firing mechanisms. By WWII mines were being laid that did not require direct contact with the target. This allowed for the use of ground mines laid on the seabed with a greater charge weight than that of the moored mines and far greater capacity to destroy shipping. In recent decades the potential use of sea mines by terrorists has added another dimension to the threat. Most recently, incidents in the Persian Gulf have reinforced the need to be able to combat both new and older types of mine.

Australia's involvement in maritime mine warfare began during the colonial period in the 19th century with the employment of controlled minefields, maintained by specialised launches, as part of the defences of colonial capital cities. The RAN began combating sea mines in 1917 when three auxiliary minesweepers were requisitioned, to sweep the Victorian coast. Since then Australia has maintained a mine warfare capability, conducting minesweeping operations in Australian and regional waters during and after WWII, as well as in China and Malaysia.

Although initially dependent upon converted civilian vessels for mine countermeasure

operations, the RAN operated 56 *Bathurst* class fleet minesweepers throughout WWII and the early postwar years. The capability was maintained with the procurement of the Ton class minesweepers in the early 1960s. Two ships of the class were converted to minehunters in the late 1960s, ushering in a new era in the RAN's mine warfare operations. Two prototype inshore minehunters operated from 1986 to 2001, maintaining the RAN's experience in minehunting, until the entry into service of the six Australian-built *Huon* class coastal minehunters from 1999.

The extent of post-war mine and explosive ordnance disposal (EOD) duties convinced the RAN of the need for a permanent force trained to augment conventional minesweeping forces in confined and shallow waters, and the Clearance Diving Branch was formed in 1951. Clearance Diving Teams (CDTs) deployed for operations during the Vietnam War, and subsequently to Kuwait, East Timor and Iraq.

OPERATIONAL ENVIRONMENT

The sea mine is a sea denial weapon. The laying of even a limited minefield in port approaches, in focal areas, or in choke points can deny an adversary free access. A known or suspected minefield will compel an adversary to either accept the loss of access and associated costs or commit resources to lengthy and costly mine countermeasures (MCM) operations. Minefields can be used protectively in support of allied shipping or aggressively against an adversary. A mining threat will affect an adversary through disruption of plans, hindrance of maritime activity, lowering of morale, and disruption of national economy.

Given Australia's dependence on maritime trade, mining an Australian port would effectively close that port, with effective MCM assets providing the only means to reopen it afterwards. The defence of Australia requires an effective and balanced mine warfare force incorporating a combination of minehunting, minesweeping, clearance diving, and mining capabilities. The mine warfare force must be capable of deployment as required to support Australia's strategic interests and objectives. By maintaining this capability the mine warfare force can achieve the mission of ensuring the safe transit of naval units and commercial shipping through sea mine threat areas.

CAPABILITY

MCM Ships and Units

The RAN currently employs the following ships and units in the conduct of defensive MCM.

- **The Deployable Commander Mine Warfare and Clearance Diving (MCD) Task Group, including the Mine Warfare Command Support System**. This is a deployable headquarters capable of planning and executing MCM operations from either a sea or shore based headquarters. Small components of the headquarters may be deployed as part of a multinational headquarters. The task group regularly conducts exercises with Five Power Defence Arrangement (FPDA) nations, the Royal Navy (RN), Canadian Navy and the United States Navy (USN), both in Australia and abroad.

- ***Huon* class Coastal Minehunters (MHC)**. The six *Huon* class vessels are capable of conducting minehunting and minesweeping operations to a maximum depth of 200 metres. The MHCs carry RAN clearance divers.

- **Minesweepers**. Two auxiliary minesweeping vessels which are capable of conducting mechanical and influence sweeping, and three remotely-controlled minesweeping drone boats capable of conducting precursor operations to sweep mines targeting minehunters and minesweepers.

- **Clearance Diving Teams**. The two permanent RAN CDTs have the ability to locate, identify, dispose of and exploit mines in the shallow and very shallow water regions. A third RAN CDT is formed and deployed for specific military operations. All CDTs may be employed in advance force operations, port and wharf clearances, and in support of MHC operations. They also possess specialist diving, salvage, demolition and EOD skills that can be used in other operations such as:

    - underwater and land-based EOD and improvised explosive device disposal;

    - support to amphibious operations by undertaking;

        - landing site reconnaissance and survey,

        - landing site sea mine and obstacle survey and clearance in very shallow water, and

        - other maritime tactical operations as required.

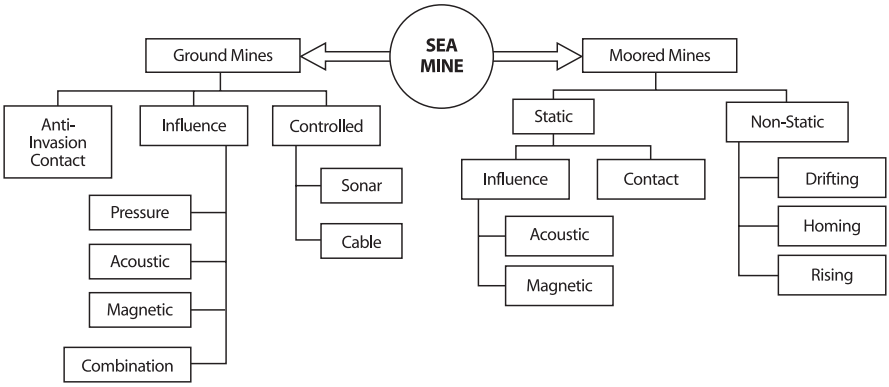
- contributing to advanced force operations such as interdiction and diversion;
- undertaking other specialist diving operations assigned (eg. placing and recovery of underwater sensors, offshore maritime counter-terrorist); and
- limited underwater battle damage patching, repair and salvage capability to assist a damaged ship to return to a support facility for more comprehensive repairs.

- **Naval Reserve Diving Teams**. The eight naval reserve dive teams have a limited diving and salvage capability that can be utilised to supplement the CDTs or to backfill CDT roles when the CDTs are deployed.
- **Operational Support Unit**. The unit provides analysis of MCM operations, evaluation of MCM effort, intelligence and forward-based logistics support to deployed MCM forces.
- **Naval Reserve Mine Warfare Groups**. The two Groups have the ability to supplement headquarters staff, support mine sweeping operations and provide additional personnel to the Operational Support Unit.

MILITARY TASKS

Sea Mining Operations

The advantages of employing the sea mine include engaging an adversary at minimal risk to ADF forces; providing the possibility of delivering a pre-emptive defensive attack; engaging an adversary with a covert weapon that maintains a continuous threat; forcing an adversary to operate both military and commercial shipping in areas that make them more vulnerable to other weapons; forcing an adversary to maintain an MCM capability; and presenting an adversary with a significant psychological threat. The disadvantages of employing sea mines include the dangers to mine warfare vessels and friendly shipping, as well as the requirement, under international law, to clear away all mines after the conflict is over.



Classification of Sea Mines

Mine Types

The sea mine threat may be described under two main categories. Moored mines are positively buoyant, attached to the seabed, floating at a pre-determined depth below the sea surface, and are laid in water depths of up to 300 metres. Ground mines are negatively buoyant, resting on the seabed, and are laid in water depths of up to 200 metres against surface shipping or 300 metres against submarines.

The two main sea mine categories can be subdivided into sub-types dependent upon their method of operation and actuation, as shown in the diagram above.

Operational Planning

Minefield planners should take into account the following factors:

- **International Legal Regime**. Minelayers are required to adhere to the international rules laid down in the *Hague Convention Relative to the Laying of Automatic Submarine Contact Mines 1907*.

- **Environmental**. Water depth, bottom composition, tidal range, current and local water conditions will affect the type of sea mine selected for the minefield.

- **Adversary MCM Capability**. The capability of an adversary to undertake successful MCM operations will affect the type of sea mine and the extent of the minefield required to meet the objective.

- **Minefield Weapon**. The minefield rather than individual sea mines should be considered the weapon.

- **Ship-count**. The use of ship-count mechanisms in the sea mines laid will present a threat to a succession of ships and decrease the effectiveness of minesweepers. A ship-count mechanism automatically activates a mine after a certain number of ships have passed over it.

- **Arming Delays**. The use of arming delays in the sea mines laid will provide an element of uncertainty to an adversary and present greater difficulties to minesweepers. Arming delays automatically activate a mine after a certain period of time, releasing the cable on a moored mine and allowing it to rise into position from the seabed.

- **Types of Triggers**. Mines can be activated using a variety of triggers, including contact, acoustic, magnetic, and pressure. Using a mixture of triggers in the sea mines laid will force an adversary to sweep for all types, increasing the effort required to clear the mines and lengthening the clearance task.

- **Intended Target**. The intended target will affect the type of mine selected and the settings applied.

- **Spacing**. The spacing of sea mines laid will be dependent upon the manoeuvrability of the platform employed in laying the minefield, and upon the required proximity of adjacent mines.

- **Laying Platform**. The availability of a laying platform will affect the number of sea mines laid and the accuracy of the resultant minefield.

- **Position Accuracy**. Sea mine positions, especially defensive or protective mines, must be accurately charted to enable safe passage of own forces and to facilitate eventual clearance.

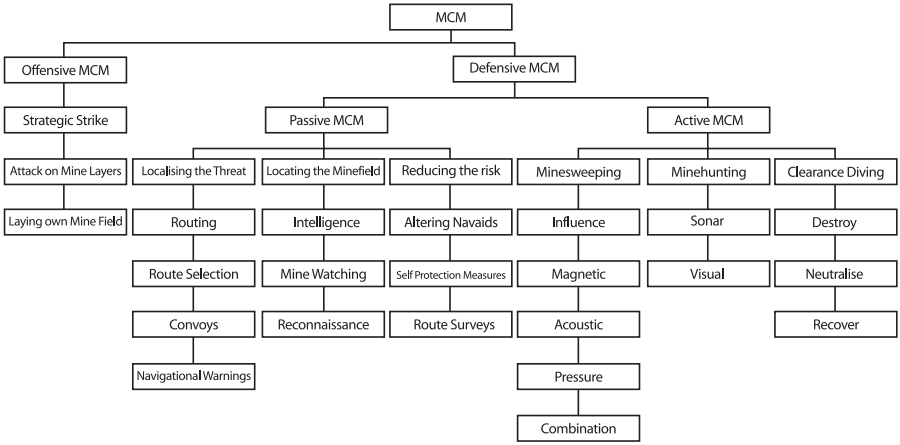
- **Effectiveness**. Minefields need to be checked and/or re-laid at regular intervals.

The Lingering Threat

Each year RAN CDTs respond to a variety of EOD taskings in Australia involving the discovery of mines laid in WWII. They also provide EOD assistance to other nations within the region to deal with Allied and Japanese WWII ordnance. NATO MCM forces routinely undertake clearance operations in the Baltic Sea and mine danger areas remain active in the Persian Gulf.

Mine Countermeasures Operations

The diversity of sea mine types available to an adversary means that the planners of MCM operations need to consider a number of different approaches. MCM operations may be divided into offensive and defensive. The main MCM options are illustrated below.



MCM Operations

Offensive

Offensive MCM operations are carried out to prevent an adversary from successfully laying sea mines and include:

- strategic strike against an adversary's mine warfare infrastructure conducted by RAAF strike aircraft or Australian Army special forces;
- maritime strike conducted by RAAF strike or fighter/ground attack aircraft or by RAN ships, against an adversary's seaborne minelayers enroute to the mine laying areas;
- air attack, conducted by RAAF fighter aircraft, against an adversary's airborne minelayers enroute to the mine laying areas; and
- laying strategic or tactical minefields.

Defensive

Defensive MCM operations are carried out to remove or reduce the threat after sea mines have been laid and include:

- passive measures, such as the localisation, identification and avoidance of the threat through intelligence, peacetime route survey operations, route selection and publication of mine danger areas;

- active measures, such as the use of MCM assets to remove, destroy or neutralise the mines or delineate the probable limits of the minefield. The two main measures are;

    - **Minesweeping**. Minesweeping techniques use either influence or mechanical sweeps towed behind the minesweeper. Influence sweeps are designed to emulate the magnetic and/or acoustic signatures of a surface or sub-surface target and explode the mine. Mechanical sweeps are designed to cut the mooring cables of buoyant mines, using explosive cutters attached to the sweep wire, allowing the mine to float to the surface for subsequent disposal. Influence minesweeping is conducted by towing a specially designed rig astern of a minesweeper. These can be used in any combination to precisely emulate the magnetic and acoustic signature of the target vessel to these types of mine.

    - **Minehunting**. Most sea mines can be detected and classified by the use of high definition sonar. Once classified as a 'possible' mine, remotely controlled underwater mine disposal vehicles or divers can be deployed to identify and destroy or neutralise the mine. The principal advantage of minehunting over minesweeping is that minehunters use forward-looking sonar, which enables the vessel to avoid passing over a mine while searching. It is currently the only practical MCM technique to counter the pressure mine.

Australian Clearance Diving Team THREE – Operation Iraqi Freedom

The RAN deployed 30 Clearance Divers to Iraq in February 2003. The team integrated with 150 US and UK specialists to form the Underwater Mine Counter Measures task unit, which was responsible for clearing the ports of Umm Qasr and Az Zubayr. Employing Unmanned Underwater Vehicles, the USN's Marine Mammal System, and coalition divers, the task unit cleared in excess of 2 million square metres of water, identifified 170 underwater contacts and conducted field exploitation and disposal of captured mines. The clearance allowed the rapid flow of humanitarian and strategic aid to assist in the reconstruction of Southern Iraq. Subsequently, as the task unit had opened the two main commercial ports of Iraq, it contributed directly to the economic reconstruction of the nation. The organic EOD capabilities of CDT THREE personnel were used to clear the wharves of Umm Qasr, the Az Zubayr helicopter facility and the Al Faw Peninsula. Additionally, Australian personnel were involved with the planning and execution of obstacle clearance in support of an amphibious landing on the Al Faw peninsula.

CONSTABULARY TASKS

In addition to their primary military functions, RAN MCM ships and units can also contribute to a range of constabulary tasks.

Border Protection

MCM ships can contribute to fisheries protection and the prevention of illegal immigration, by supplementing patrol boat and surface combatant patrol operations.

Peace Operations

MCM ships have contributed in recent years to ADF and coalition peacekeeping and peace building operations in Bougainville, East Timor and the Solomon Islands, by providing a stabilising presence and contributing to patrols intended to monitor ceasefires.

Defence Force Aid to Civilian Authorities

The RAN provides clearance divers to the Australian Army Tactical Assault Group East for the conduct of maritime counter-terrorism operations.

Tasman Bridge Disaster – January 1975

On 5 January 1975 the bulk carrier *Lake Illawarra* collided with the Tasman Bridge, which spanned the Derwent River in Hobart. The ship sank killing seven of the crew, and collapsing two pylons and 127 metres of bridge decking into water 110 feet deep. Four motor vehicles fell into the river, killing five occupants.

A detachment from CDT TWO flew to Hobart for search and recovery operations. The Navy divers operated in hazardous conditions, with minimal visibility and strong river currents. Divers had to contend with underwater obstructions, falling debris and even 'live' power cables in the water.

DIPLOMATIC TASKS

The RAN's MCM ships and units also contribute to a range of diplomatic tasks.

Defence Assistance to the Civil Community

MCM units can provide an underwater or land-based EOD and improvised explosive device disposal capability, to assist police and Army units. The CDTs possess specialist underwater search and deep water diving support capabilities, which makes them well suited to performing search and rescue operations or assisting police divers in this task.

Non Combatant Evacuation Operations

MCM ships and units can conduct preliminary reconnaissance, survey and, if necessary, clearance of approaches to beach landing sites used in operations undertaken to protect or evacuate Australian nationals during regional crises.

Assistance to Foreign Nations

Since 1945 RAN MCM units have cleared enormous quantities of mines and unexploded ordnance from South East Asia, Papua New Guinea, and the islands of the South West Pacific. Additionally, they have contributed to regional disaster relief operations and the clearing of passages through reefs.

Operation Gold – 2000 Sydney Olympics

In 2000 members of Australian CDTs ONE and FOUR formed a ready response cell as part of the wider ADF Operation Gold. The team contributed to the security of underwater constructions and maritime infrastucture involved in the Olympics by providing diving and improvised explosive device response teams. Over two weeks 50 incidents were responded to and resolved. Similar taskings have subsequently occurred for the Commonwealth Heads of Government Meeting and the Commonwealth Games.

LIMITATIONS

The effectiveness of the MCM effort is expressed in terms of percentage clearance and reduction of risk to vessels entering the cleared waters. Therefore a mixture of the risk that is acceptable to supported commanders, the clearance required to reduce that risk and the time taken to achieve that clearance, determines the end state of operations. In some cases the required level of clearance may not be achievable in the time required and the supported commander will have to make the decision to either accept the higher risk or extend the time allowed for the operation. In making these assessments the following constraints should be taken into account:

- **Buried Mines**. There is currently no system employed within the RAN for the detection of buried mines, although research into synthetic aperture sonar imaging is expected to solve this.

- **Surf Zone Mines**. Surf zone clearance remains extremely limited and vulnerable to environmental factors, resulting in increased risk.

- **Self-Protection**. The MCM vessels have a very limited self-protection capability and protection of the scarce MCM assets by other warships and combat aircraft may need to be considered.

- **Speed**. In clearance operations the requirement to ensure full coverage and achieve a high probability of mine clearance usually limits MCM vessels to a very low speed. This limits the number of operations that can be conducted with the RAN's MCM force.

- **Tempo**. MCM vessels carry small crews. Most evolutions involve the whole crew and extended operations must be carefully planned to allow for crew rest and systems maintenance. Additionally the small size of MCM vessels means they cannot perform their full function above sea state 4. Operations are frequently delayed by increased sea states.

- **Clearance Diving**. Diving operations present their own limitations and amongst other considerations planners must take into account the sea state, decompression routines, emergency procedures, and the operating environment.

- **Logistics**. A solid logistics infrastructure is required to support deployed MCM forces. In addition to the provision of repair facilities, victuals and fuel, the ships will require regular re-supply of mine disposal charges.

- **Simultaneous Operations**. The RAN has limited MCM assets, and is thus restricted in its capability to conduct simultaneous, geographically dispersed operations in Australian waters, including the offshore territories and resource areas.

NAVAL AVIATION

14

- Fitted with advanced sensors and weapons, RAN helicopters can operate as an integral component of the parent ship's weapons and sensor suite, extending the detection range of the force, maximising the offensive range, and reducing vulnerability to attack.
- All RAN helicopters also possess an inherent personnel and cargo transport capability that may be used in support of their parent ship or broader ADF operations.
- In addition to their primary military roles, RAN helicopters provide a useful capability across a broad spectrum of diplomatic and constabulary roles.

HISTORY

From the gun turret launching platforms on the battlecruiser HMAS *Australia* in 1917, through the operation of Royal Australian Air Force (RAAF) seaplanes from its survey vessels post-war, to the commissioning of the purpose built seaplane carrier HMAS *Albatross* in 1929, the RAN was intimately involved in the dawn of naval aviation.

Whilst the RAN did not operate an appreciable aviation capability during WWII, being limited to carrying RAAF amphibian aircraft aboard its cruisers, the Japanese attack on Pearl Harbor, the battles of Midway and the Coral Sea, and the close air support of amphibious operations by both sides in the Pacific, heralded the rise of embarked aviation as a highly effective naval weapon.

The modern RAN Fleet Air Arm (FAA) was born in June 1947 when the government approved the purchase of the light fleet aircraft carriers HMAS *Sydney (III)* and HMAS *Melbourne (II)*. The naval air station, HMAS *Albatross* was commissioned a year later to provide a land base for the FAA when the squadrons arrived in Australia. The FAA was not long in proving its worth. HMAS *Sydney (III)* served in the Korean War, where its embarked Hawker Sea Fury and Fairey Firefly aircraft conducted ground attack missions in support of United Nations (UN) troops.

FAA personnel served in the Vietnam War, flying the Iroquois helicopter on troop transport missions with the US Army's 135th Assault Helicopter Company and No. 9 Squadron RAAF. The FAA subsequently participated in a range of peace operations, flying Iroquois helicopters in the Sinai, and Squirrel, Seahawk and Sea King helicopters in Bougainville, the Solomon Islands and East Timor. The force also participated in the 1991 Gulf War, the subsequent 12 years of maritime interception operations, the 2003 Iraq War, and ongoing operations in the Persian Gulf.

For over fifty years, the FAA has operated fixed and rotary wing aircraft at sea in support of Australia's maritime forces. The RAN has operated 22 aircraft types to and from over 20 different Australian naval ships and countless foreign warships.

OPERATIONAL ENVIRONMENT

The decommissioning of the aircraft carrier HMAS *Melbourne (II)* in 1982 heralded a fundamental change in the make up and raison d'etre of the FAA. Now a purely helicopter force operating from all RAN major combatants and support vessels, the FAA provides an integral extension of the weapons, sensor and support systems of each ship and an overall task force. As such, naval aviation assets and personnel face the same threats as the vessels aboard which they are embarked, as detailed in Chapters 8-10, and 15.

Additionally, RAN helicopters, whether operating on military or civilian support tasks, face a range of threats related to their operating environment independent of the fate of the platform from which they are flying. This can include extremes of weather, such as occurred during the rescue operations for the 1998 Sydney to Hobart yacht race, as well as the dangers inherent in low flying and the risk of mechanical failure.

CAPABILITY

The modern warship has the ability to project force to extended ranges, yet the range at which legitimate targets may be detected and identified with their ship borne sensor systems remains limited by the fundamental laws of physics. Operating as an integral component of the parent ship's weapons and sensor suite, the modern naval helicopter extends the detection range of the force, maximising the offensive range and reducing vulnerability to surprise attack. Naval helicopters may be fitted with radar, active and/or passive sonar, magnetic anomaly detection, forward looking infra-red (FLIR) and electronic support measures systems, as well as a range of anti-surface and anti-submarine weapons.

The rapid projection of force ashore, and the ability to land appreciable land forces from the sea, is a critical capability for the Australian Defence Force (ADF). In addition to

their war-fighting capabilities, the helicopter provides a quantum increase in the speed of delivery of troops and equipment to the point of entry in an amphibious operation. The versatility of the platform allows far more rapid lodgement, re-supply, and casualty evacuation than the traditional landing craft. The helicopter is not limited to delivery to the beach, thereby providing far greater options of manoeuvre to the commander of an amphibious operation.

Stores and equipment may be transferred as an external load hung from a helicopter cargo hook. Stores, equipment and personnel may also be carried in the helicopter cabin and delivered by landing on or winching down to the ship.

Structure

The RAN Aviation Force Element Group, which is based at HMAS *Albatross*, comprises:

- the Commander Australian Navy Aviation Group (Aviation FEG);
- 723 Squadron operating the AS-350BA Squirrel primarily in the training role;
- 805 Squadron, operating the SH-2G (A) Super Seasprite primarily in the anti-surface role;

- 816 Squadron, operating the S-70B-2 Seahawk primarily in the anti-submarine role;
- 817 Squadron, operating the Sea King Mk50A/B primarily in the utility role;
- the Air Warfare Systems Centre;
- the Fleet Air Engineering Unit; and
- the Aircraft Maintenance and Flight Trials Unit.

The FEG Commander is responsible to the Maritime Commander (MC) for providing a naval aviation capability and to the Chief of Airforce (CAF), through MC, for operational airworthiness. The Squadrons are commanded by MC and are responsible for training maintainers and aircrew for embarked flights and providing technical and operational support to the flights as required.

Because helicopter flights regularly embark aboard RAN ships, in addition to their specialist aviation training, FAA personnel receive general service training, which includes shipboard damage control, first aid, survival at sea and life at sea experience. This training ensures the embarked aviation complement can fully integrate with the ship's routines and contribute to whole ship daily and emergency evolutions.

MILITARY TASKS

RAN helicopters can perform a range of military roles in support of RAN or ADF operations.

Surface Warfare

Using the suite of sensors including visual search, RAN helicopters can detect, track, classify and identify surface contacts in both open-ocean and littoral theatres, usually outside or at the limit of the force's weapons coverage. The helicopter offers a range of responses from shadowing targets of interest to permit the force to avoid confrontation, through to engagement with an airborne weapon, to providing targeting for ship-launched weapons at extended range. The helicopter can enable the force to engage a target without placing surface assets in danger.

The SH-2G (A) Super Seasprite is optimised for littoral operations, and is intended to provide the FAAs primary anti-surface warfare capability, combining a sensor suite with the Penguin anti-ship missile. The S-70B-2 Seahawk, although optimised for anti-submarine warfare, provides a credible anti-surface detection and targeting capability for the Harpoon anti-ship missile carried by the RAN's major surface combatants.

Undersea Warfare

Submarines pose one of the greatest threats to surface ships, due in part to the difficulty of detecting them using ship-based systems. Modern helicopters equipped with a range of advanced sensors provide the ability to detect, track, classify, identify and attack submarines safe from the threat of modern submarine launched torpedoes. The ability to detect the submarine at range allows for the threat to be neutralised either by attacking the submarine or simply by avoiding the threat area.

The buoyant sea mine is simple and cheap to possess and poses a significant threat to naval operations in confined waters. The effectiveness of this threat has been evident during operations in the Persian Gulf region for two decades. Naval helicopters can detect mines on or near the surface well before they become a threat to the force. The helicopter can then deliver clearance divers to neutralise or destroy the mines.

The S-70B-2 Seahawk is optimised for undersea warfare, with its sensor and weapon fit, and is the FAA's primary undersea warfare platform. The SH-2G (A) Seasprite and Sea King Mk50A/B are both capable of carrying and deploying anti-submarine weapons, although both rely on sensor data provided from other aircraft or ships.

Amphibious

In addition to their weapons and sensor capabilities, naval helicopters have inherent personnel and cargo carrying capability if employed in the utility role. The naval helicopter provides a rapid, mobile over the beach capability for amphibious operations. The troop-carrying helicopter can deploy over greater distances and at a higher speed than traditional landing craft, and can operate beyond the shore, allowing troops to outmanoeuvre hostile forces.

All RAN helicopters are capable of carrying troops and cargo, if suitably configured, although the primary utility helicopter is the Sea King Mk50A/B.

CONSTABULARY TASKS

RAN helicopters are also well suited to provide support to a range of constabulary operations.

Sanctions and Embargoes

Since the invasion of Kuwait in 1990 and in the subsequent UN embargo operations on Iraq, the RAN has had a significant role in the visit, board, search and seizure of

shipping within the Middle East Area of Operations. The helicopter provides several complementary capabilities, from providing top cover with a cabin mounted machine-gun to rapid insertion of a boarding party by 'fast rope'. The availability of a helicopter provides a range of responses applicable to the level of compliance exhibited or expected from the target vessel.

Defence Force Aid to Civilian Authorities

RAN helicopters possess inherent capabilities suitable for the support of civil authorities. These have included but are not limited to drug surveillance and interdiction, fisheries protection, and border protection operations.

DIPLOMATIC TASKS

In addition to their primary military role, RAN helicopters provide useful support to diplomatic activities.

Defence Assistance to the Civil Community

The inherent personnel and cargo carrying capabilities of the naval helicopter, specific communications and detection capabilities, and their ability to operate from relatively small unprepared sites, ideally suit these platforms to aid operations. From delivering food and aid to flood victims, to water bombing bush fires, the helicopter is an effective disaster response and relief platform.

Bushfire Support, Shoalhaven 2001

On 25 December 2001, 723 and 817 Squadrons were put on alert to support bushfire-fighting operations in the Shoalhaven region of NSW. The first helicopter of 723 Squadron launched shortly after first light on 26 December to map the fire front. As the fires expanded, the RAN was called upon to provide additional assistance. Over the next 18 days, 723 Squadron and 817 Squadron flew 221 and 70 hours respectively supporting efforts in the Shoalhaven, Sydney basin and Hunter districts. The aircraft conducted fire mapping, attack direction, water bombing and fire party insertion and extraction during the period that became known as 'Black Christmas'.

Search and Rescue

The systems and versatility that suit the helicopter to military operations are also valued in the Search and Rescue environment, and RAN helicopters are regularly called upon to support both military and civilian search efforts. The SH-2G (A) Seasprite, S-70B-2 Seahawk and Sea King Mk50A/B are all highly capable search units over land and over water. All three helicopters are fitted with rescue winches, providing a rescue capability where landing is not practicable, such as over water or dense forest.

LIMITATIONS

While the attributes of RAN helicopters suit them to a broad range of military operations and non-military tasks, they also possess a number of limitations which must be considered.

Range/Endurance/Availability

Naval helicopters have the ability to greatly extend the area of influence of both their parent vessels and a task group. However, the persistence of this capability, particularly the individual and cumulative flight hours available over a period, is limited by the endurance and number of helicopters and crews embarked, and the number of ships available to support them. Normally RAN surface combatants will carry one helicopter and two crews, although during higher-level operations the *Adelaide* class frigates can carry two aircraft and three crews. The primary limiting factor to availability is often the maintenance crew who, in addition to maintaining the helicopter in a ceaselessly moving environment, provide the bulk of the flight deck crew and fire party during flying operations, and assist with other ship activities such as replenishment. Naval aviation, in the Australian context, provides a transient presence.

Sustainability

Wedded to the limitation of availability is that of sustainability. Helicopters are resource intensive to maintain. The greater the number of hours flown, the greater the use of consumables such as fuel, oils and expendable stores and sensors. As maintenance schedules are based on cumulative flying hours, higher tempo operations mean that aircraft services occur at more frequent intervals. Some maintenance procedures, such as placing the aircraft on jacks, can be very hazardous on a moving deck and are, in all but the most extreme cases, conducted while the ship is alongside. The corrosive nature of the maritime environment requires additional aircraft husbandry. The complexity of some systems and lack of specialist repair capability afloat dictates a

repair by replacement philosophy for these systems. With the limited stores capacity of surface combatants, sustaining a naval helicopter presence during high tempo operations can be a challenge for the logistics system.

Cost / Technology

The modern naval helicopter is a technologically advanced, sophisticated capability. With high technology comes improved performance and, to a degree, greater reliability. However, this level of technology is expensive, often coming at the price of greater complexity, greater levels of maintenance equipment and skill, and smaller numbers of helicopters and aircrew. This makes sustaining multiple, concurrent and high intensity operations a challenge, and prioritisation of effort can be a limiting factor in whether a helicopter is available at a time and place desired by an operational commander.

MARITIME GEOSPATIAL INFORMATION AND SERVICES

15

- Maritime military geospatial information is a key enabler that provides situational awareness across all warfare disciplines.
- The RAN undertakes the national charting task in addition to its military hydrographic survey task.

HISTORY

The vagaries of wind, water and weather have influenced, if not controlled, activity at sea for centuries. Possession of environmental knowledge has, on many occasions, been a key factor in the success or failure of naval operations. From the 18th century modern navies began to take a scientific approach to solving the problems of predicting geographical and environmental threats, forming specialist organisations to concentrate on collecting, analysing and distributing military geospatial information (MGI). The history of the RAN's involvement in the three generally related aspects of hydrography, oceanography, and meteorology stretches back almost a century.

Hydrography

Hydrography involves the study of the ocean floor and the provision of maritime charts. In the 18th century navies increasingly realised that the possession of charts was a fundamental enabler to successful operations. France established a hydrographic office in 1720, Denmark in 1784 and Spain in 1800. The British Admiralty Hydrographic Office was established in 1795. This followed a century in which more ships were lost through navigational mishap than were lost in battle. The Admiralty, as part of its worldwide interests, carried out surveys and published charts for the Australian coast until the 20th century in support of the defence and commercial development of the colonies.

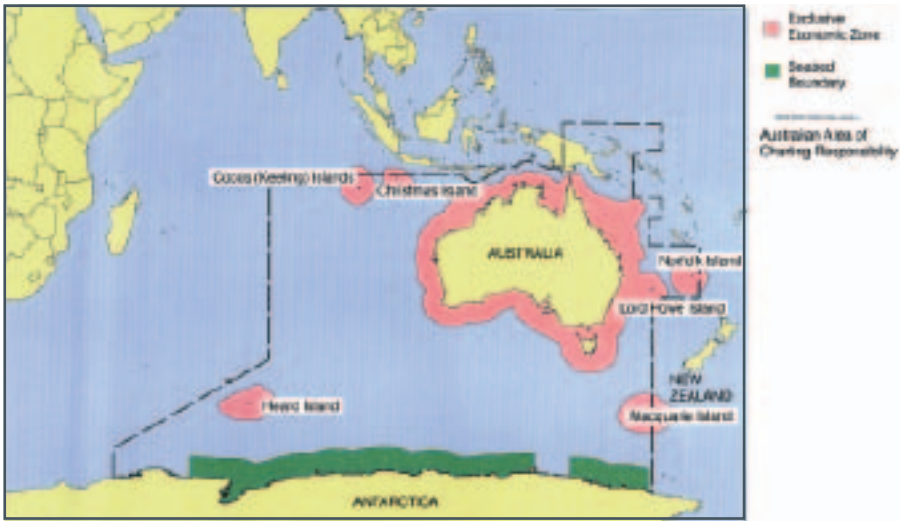
The RAN assumed responsibility for the hydrographic surveying of Australian waters from the Royal Navy (RN) on 1 October 1920, and the following year Australia became one of the founding members of the International Hydrographic Bureau. The sloops

HMAS *Geranium* and HMAS *Fantome* were fitted out for surveying duties, and in 1922 *Geranium* embarked a RAAF Fairey IIID seaplane, becoming the first vessel to use an aircraft for hydrographic surveying operations. In 1925 the sloop HMAS *Moresby* was added to the hydrographic force. Although reduced in size during the Great Depression, the force continued to conduct routine and strategic surveys in Australia's northern waters.

The hydrographic effort in support of amphibious landings in the South West Pacific campaign, in the form of Task Group 70.5, a mixed RAN-USN force under Australian direction, was a vital contribution to the war. Largely uncharted waters were surveyed, sometimes under enemy fire, in the lead up to landings at Kiriwina, Manus, and in the Philippines. Surveys were conducted by RAN frigates, sloops, corvettes and motor launches.

In 1946 the Australian government formally made the RAN responsible for providing Australia's national hydrographic service; which entails undertaking hydrographic surveys and developing derivative products, such as charts and publications, for military and civil purposes. It also endorsed a 25-year program to replace all Admiralty charts in Australia's area of interest in New Guinea, the Coral Sea and the Solomon Islands. During the post-war years hydrographic surveying continued to be conducted by converted ships such as the frigate HMAS *Diamantina* and the boom defence vessel HMAS *Kimbla*. The RAN's first purpose-built hydrographic survey ship, HMAS *Moresby (II)*, entered service in 1964. A second survey ship, HMAS *Flinders*, entered service in 1973. These ships remained in service until 1998, and were replaced by the four *Paluma* class survey motor launches from 1998 and the two *Leeuwin* class survey ships from 2000. The Laser Airborne Depth Sounder (LADS) system, which entered service in 1993, reduced the dependence on surface vessels in clear coastal waters, freeing the new survey ships and launches for complex, deeper water surveys.

The national charting role was re-confirmed in 1988 after a review of Commonwealth mapping activities. This review acknowledged the benefits of the RAN Hydrographic Service fulfilling concurrently both a national and a Defence role. The most obvious benefits are the avoidance of duplication of effort and the inherent advantages of the RAN being able to access all available data in times of need.



Area of Charting Responsibility

Meteorology

Meteorology involves the study of wind and weather, and its impact on the maritime environment. Seafarers have been taking weather observations since ships first went to sea, but the formal study of meteorology is of more recent origin. At the outbreak of war in 1939, the RAN formed a short-lived Aviation Meteorological Branch, which was transferred to the RAAF Directorate of Meteorological Services when it was formed in 1941. A meteorological office was established at the then RAAF Base Nowra, which commenced operations on 7 May 1942 in support of the United States Army Air Corps and the Royal Netherlands East Indies Air Force. Units of the RN's Fleet Air Arm (FAA) subsequently operated out of Nowra from October 1944. On 3 July 1947, the Commonwealth Defence Council approved the formation of a RAN FAA and HMAS *Albatross* was commissioned at Nowra on 31 August 1948. Meteorological support for the Nowra airfield transferred to the RAN and a naval meteorology service has existed continuously since that time. From 1948, meteorological personnel have regularly deployed aboard major warships to provide operational meteorology advice.

Operation Overlord: A Crucial Meteorological Decision

On 8 May 1944, General Dwight D. Eisenhower determined that the D-Day landings in Normandy would take place on 5 June. Weather forecasts continued to be favourable for the landing until 2 June, when one of three Allied operational forecasting centres became pessimistic about the expected weather. By 4 June all the centres forecast that the weather would be unfavourable. Eisenhower delayed a force of 2700 ships and 176,000 personnel, postponing the landings by one day. The storm that ensued on 5 June would have been disastrous, but the landings on 6 June 1944 were a success. While the German High Command possessed the same meteorological information as Eisenhower, it ruled out the possibility of invasion in early June due to the poor weather conditions. In this they underestimated the capability of the Allied forces to conduct operations in marginal weather conditions. This demonstrates that knowledge of the prevailing environmental conditions, together with knowledge of the capability of your forces, can provide a decisive edge in military operations.

Oceanography

Physical oceanography includes the study of temperature, salinity, acoustic, current and bathymetry information, and is crucial to the optimisation of systems for submarine and underwater weapon and sensor performance. Prior to WWI the analysis of parameters other than bathymetry was of limited interest to navies. The introduction of the submarine into naval warfare made an understanding of the conditions in the undersea environment critical for offensive and defensive purposes. The RAN has operated submarines since 1914, and has needed to understand how best to use varying oceanographic conditions to avoid detection and successfully conduct operations. RAN surface vessels were fitted with ASDIC detection systems prior to WWII and the use of sonar for submarine and mine detection continued after the war.

During WWII various navies discovered the temporal nature of underwater acoustics; similar surface weather and sea state conditions resulted in very different underwater acoustics. The study of oceanography to discover and predict this variability in acoustic conditions in support of anti-submarine warfare (ASW) was established around the world during the post-war years. It was not until 1955, when the Fairey Gannet anti-submarine aircraft was introduced into RAN service aboard the aircraft carrier HMAS *Melbourne (II)*, that oceanography became firmly embedded as a component of ASW. The RAN's capability in meteorology and oceanography (METOC) was established in

1948 and METOC officers aboard *Melbourne* provided the tactical oceanographic advice to RAN ASW Squadrons. Range prediction systems used by the RN were quickly adopted and used bathythermograph measurements from major warships to predict sonar performance. The RAN's METOC capability continues today through the Directorate of Oceanography and Meteorology. METOC qualified officers frequently deploy with naval task groups in support of operations around the world including East Timor and the Persian Gulf recently.

Oceanographic data management was established through the creation of the Australian Oceanographic Data Centre (AODC) in 1964 under a United Nations (UN) sponsored scheme to establish National Oceanographic Data Centres. Data from warship bathythermographs and other sources was routinely forwarded to the centre for quality control and collation into databases. In support of the collection of oceanographic data the research ship HMAS *Cook* entered service in 1980, but was removed from service in 1990 to achieve personnel and cost savings. By this time sufficient oceanographic data was becoming available from overseas sources and through cooperative arrangements in Australia. The advent of modern Internet technologies has seen the capacity for numerous marine data agencies to 'virtually' connect their data holdings. The establishment of the Australian Ocean Data Joint Facility (AODCJF) in late 2005 will see a more collegiate approach to oceanography and the end of the concept of a single organisation being the national data custodian. The AODCJF will bring together data from: Geoscience Australia; the Australian Institute of Marine Science; the Australian Antarctic Division; the Commonwealth Scientific and Industrial Research Organisation (CSIRO); the Bureau of Meteorology and the RAN. The Joint Facility will harness the national oceanographic capability, rather than have each organisation rely on its own resources.

OPERATIONAL ENVIRONMENT

Without nautical charts and the necessary associated hydrographic knowledge, ships cannot operate safely, efficiently or flexibly. Without knowledge of meteorological conditions and weather forecasts, operations at sea can be rendered ineffective, or faced with severe hazard and difficulty. Without knowledge of oceanographic conditions, many surface and sub-surface weapons and sensors will not perform optimally and their effects may be limited. Hydrographic, meteorological and oceanographic data and information are therefore fundamental enablers of maritime operations as well as more generally of national and commercial infrastructure.

All forms of warfare benefit from a knowledge and understanding of environmental conditions. This not only provides an essential basis upon which friendly forces can be deployed, but provides an equally valuable insight into the options and constraints

presented to an adversary. This is true at sea, where the absence of certain environmental data (detailed bathymetric data or nautical charts, for example) can prevent operations taking place.

The Hydrographic, Meteorological and Oceanographic Force Element Group (HMFEG) exists to provide this information to military and civil users. This includes providing Australia's nautical charting service as required under the terms of the *United Nations Convention on the Safety of Life at Sea*. At the same time, specialist military products and services are also generated from Australia's hydrographic data archive, the AODC and by the Directorate of Oceanography and Meteorology, which along with surveying ships and other data gathering elements, are part of the HMFEG. The HMFEG Headquarters is directly involved with the day-to-day programming of MGI Units and this is done in consultation with Defence, other Federal and State government agencies and commercial organisations. The resultant program is the *HydrOcscheme*, which meets both Defence and national charting priorities, and which is promulgated within the Fleet Program.

CAPABILITY

The Australian Hydrographic Office (AHO) is in Wollongong, NSW, and houses the HMFEG Headquarters and the systems for the creation and maintenance of nautical charts, publications and supporting data sets. Data handling, validation and the production of charts and associated publications are increasingly conducted in a

wholly digital environment. While the production, revision and maintenance of paper charts continues, significant effort is now directed towards electronic chart products as well as developing an increasing range of sophisticated military-specific products for Defence operations. In addition to the standard suite of paper and electronic charts and publications, the AHO produces special charts and products, both for Defence and the wider community, as and when required.

The AHO is the custodian of Australia's national hydrographic archive, the country's most comprehensive collection of hydrographic information. The AHO is in the process of creating a single, non-conflicting, validated database of its hydrographic information. This will further enhance its capability and capacity to meet increasing requirements for hydrographic data and services. The AHO is a respected and influential world authority in electronic charting matters.

The AHO is the base for the Deployable Geospatial Survey Team (DGST), a small team of naval personnel capable of short-notice deployment to both benign and hostile environments. The DGST is equipped with portable surveying equipment and conducts both national and Defence related surveys and support in and around Australia and Antarctica.

Integral to the role of hydrographic, as well as METOC qualified personnel, is the ability to provide advice to commanders and their staff on the use, availability and significance of maritime MGI input to the tactical and strategic appreciation of the battlespace.

Directorate of Oceanography and Meteorology

The Directorate of Oceanography and Meteorology (DOM) is located on Garden Island in Sydney, NSW. The Directorate incorporates the AODC and participates in or is represented on national and international data collection, exchange and management programs and committees. The role of the DOM is to provide oceanographic and meteorological products and services in support of all levels of strategic, operational and tactical military operations. Value-added environmental support is a core input to military planning and decision making and can take the form of climatological, current or forecast information. Responsibilities of DOM include:

- **Operational METOC Centre**. The Operational METOC Centre (OMC) at Garden Island provides meteorological and oceanographic advice to the ADF. This enables greater military understanding, and improved tactical utilisation, of the physical operating environment. OMC develops oceanographic and meteorological products and services covering regional exercise areas, in order to assist planning and

operations. Deployable components of OMC are assigned to task group or other command staffs to provide advice on the tactical exploitation of the environment.

- **Naval Air Station Weather and Oceanography Centre**. The Naval Air Station (NAS) Weather and Oceanography Centre (NWOC) at HMAS *Albatross* supplies all necessary aviation weather and tactical meteorological and oceanographic support to the FAA in order to enhance its tactical employment.

- **Fleet Weather and Oceanography Centre**. The Fleet Weather and Oceanography Centre (FWOC) at Maritime Headquarters (MHQ) provides real-time maritime weather and tactical meteorological and oceanographic support to MHQ, Headquarters Joint Operations Command, and other units of the ADF.

Survey Ships

Two 70m survey ships, HMAS *Leeuwin* and HMAS *Melville*, are based in Cairns, QLD. The two ships are operated by three ships' companies on a rotational basis. This ensures a high rate of ship availability while providing adequate respite for personnel. The ships are optimised for high performance data acquisition throughout Australia's maritime area and are equipped with multi-beam echo sounders designed for enhanced feature detection in water depths of 20 to 200m. They are also equipped with a single beam echo sounder that can gather data in depths exceeding 5000m. The two ships provide the RAN's oceanic hydrographic survey capability.

As well as providing state-of-the-art surveying capabilities and the ability to supply in-theatre surveys and chart updates, the *Leeuwin* class surveying vessels possess other beneficial capabilities. They have a significant fuel capacity providing long endurance and the ability to refuel other minor war vessels. The ships have ample refrigerator, freezer, hold and storage capacities, combined with good cranes for cargo movement.

Each ship carries three survey motor boats (SMB) which can conduct surveys independently of the host ship. Each is fitted with an integrated hydrographic survey system utilising multi-beam echo sounder and side scan sonar technologies designed for enhanced feature detection in water depths between 5m and 50m. The SMBs provide the RAN's inshore hydrographic survey capability. The SMBs are not capable of long-term operations in open water, and therefore operate with a parent hydrographic vessel in support, or from a safe haven ashore.

The SMBs and any embarked helicopters provide additional logistical and operational flexibility to a force. There is office space available that can be occupied by an embarked command team such as a Mine Warfare or Advance Force Commander and a shipping container can be embarked on the quarterdeck.

Survey Motor Launches

The 36m *Paluma* class survey motor launches, HMAS *Paluma (IV)*, HMAS *Mermaid (II)*, HMAS *Shepparton (II)* and HMAS *Benalla (II)* are also based in Cairns. Each launch is crewed by 14 naval personnel and is optimised for high performance MGI acquisition in coastal waters, particularly in water depths between 10 and 70m. The ships usually operate as two fixed pairs. The vessels provide an element of the RAN's coastal hydrographic survey capability.

These survey vessels can also be called upon to support tactical operations such as mine countermeasures in the form of shallow water or port surveys: seabed search and classification; utilising precise navigation to lead fleet units though minefields; acquisition of beach intelligence; and the survey of boat lanes, anchorages and beach approaches for amphibious operations.

Laser Airborne Depth Sounder (LADS) Flight

The LADS system, which is installed in an F27-500 Fokker Friendship, is optimised for rapid data acquisition in relatively clear water to depths of 50m. The LADS Flight is based in Cairns, and is able to perform rapid surveys over large areas. It is capable of surveying very shallow or dangerous waters, not easily accessible by ships or boats and can operate independently from remote airfields. The aircraft is crewed by civilian contract pilots and maintained through a civilian maintenance contract. However, naval hydrographic specialists operate the system, to collect and conduct initial processing of data, which is further processed by the AHO.

Operation Warden / Stabilise 1999: Survey Support

In 1999 the RAN's mobile survey team joined HMAS *Success (II)* in Darwin enroute to Dili for Operation Warden/Stabilise. Before any RAN vessels entered Dili Harbour, the team conducted a preliminary survey of the harbour and passages through the adjacent reef. It identified that the reefs fringing the approach channel were incorrectly charted and also discovered a number of uncharted dangers. At the same time, the LADS Flight was deployed to Darwin for surveys on the south coast of East Timor. Five ports and beaching areas were fully surveyed in six days. Each survey was available for use by ships passing through Darwin within 36 hours of completion, and the imagery was also passed to the Australian Army.

MILITARY AND NATIONAL TASKS

Concurrent with its Defence tasks, the HMFEG has wider national hydrographic and oceanographic responsibilities. The HMFEG supports navigation safety, the protection of the environment, and sustainable development by providing knowledge of our sea areas. This role is a fundamental enabler to the maintenance of Australia's industrial infrastructure and positioning within the global community. The table below details the Defence and national tasks to which the HMFEG contributes.

<table>
<tr><th>Defence Tasks</th><th>National Tasks</th></tr>
<tr><td>Planning and execution of:
• Surface, Air and Underwater Warfare
• Amphibious and littoral warfare
• Mine warfare</td><td>Safe and efficient maritime trade</td></tr>
<tr><td>Future maritime capability and force development</td><td>Safe use of the seas by non-trade vessels</td></tr>
<tr><td>Defence scientific research and technology development</td><td>Oceanic and coastal environmental management</td></tr>
<tr><td>MGI intelligence assessment</td><td>National and international marine policy development</td></tr>
<tr><td>Command Information Systems development, validation and operation</td><td>Offshore resource exploration and exploitation</td></tr>
<tr><td rowspan="3">Modelling and Simulation Systems development, initialisation, validation and operation</td><td>Marine scientific research</td></tr>
<tr><td>Maritime boundaries delineation</td></tr>
<tr><td>Public information</td></tr>
</table>

HMFEG Tasks

In order to meet its obligations, and to provide a timely and effective service, the HMFEG maintains a high national and international profile. The HMFEG is active in various national and inter-governmental organisations. It is also a party to various agreements with allies in order to ensure a free flow of geospatial information for maritime planning and operations outside Australia's maritime area. The importance of these relationships cannot be understated; without such international engagement it would not be possible to obtain the geospatial information, or achieve the levels of cooperation and

standardisation required to support Australian maritime forces or maritime operations in general. Forces would be constrained or unable to deploy with the freedom of manoeuvre and the degree of navigational safety required of a combat force. At the same time, commercial enterprises and other national infrastructure activities would be similarly constrained.

CONSTABULARY AND DIPLOMATIC TASKS

Like other naval units, HMFEG units are suited to undertaking secondary functions such as diplomatic, surveillance and constabulary roles that can range between benign and coercive tasks. Potential roles include border protection patrols, prevention of illegal immigration, fisheries surveillance, intelligence collection, military surveillance, disaster relief and assistance to the civilian community.

LIMITATIONS

Ships and units of the HMFEG can operate at peak survey performance up to Sea State 3 and can operate at slightly higher sea states but with reduced data quality and effectiveness. They have no significant self-protection capability and operate at minimum crew levels, which can impact on long-term operations. HMFEG vessels are only equipped with machine guns for self-defence. For HMFEG forces to conduct survey and MGI operations at the tactical level under combat conditions, appropriate protection from littoral and maritime threats may therefore be required.

Limitations of the *Leeuwin* and *Paluma* classes include some seakeeping aspects and their moderate to slow transit speeds. The nature of minimum crewing also results in some limitations in the crew's ability to undertake intensive evolutions or operations. The *Leeuwin* class generally operate in water depths of greater than 20m, and are capable of operating smaller commercial and military helicopters.

The LADS aircraft has no self-protective capabilities; the aircraft is registered on the civil list and as such may only operate in a benign environment.

MARITIME TRADE PROTECTION

16

- Australia is wholly dependent on seaborne trade for its economic survival and prosperity.
- All of the nation's major population centres are on or close to the coast and the nation's ports keep those centres supplied with most of the commodities upon which every modern society depends.
- Changes in the international shipping industry since WWII mean that the protection of merchant ships can no longer be enforced. Navies can only provide Naval Cooperation and Guidance for Shipping in the face of threats to maritime trade.

HISTORY

Australia's maritime trade has been attacked in the past and its economy has been damaged by such attacks. Australia should never take its enjoyment of uninterrupted maritime trade for granted and the effect of such attacks should never be underestimated.

In WWI German naval and armed merchant cruisers conducted a guerre de course in the Indian Ocean and off South East Australia. The economic effect and drain on naval resources required to counter them far outweighed each cruiser's fighting power. For example, the attacks by SMS *Emden* caused a rise in insurance rates and commodity prices in Australia, as well as the number of ships kept in port, and the diversion of more than a dozen Allied warships to locate the cruiser until it was finally destroyed by HMAS *Sydney* at the Cocos Islands.

During WWII, from 1942 until 1944, Japan conducted an extensive submarine campaign in Australia's waters with some success. More than 40 merchant ships were attacked off the NSW coast during 1942–43 alone. Once again a large number of warships and coastal patrol aircraft were tasked to protect maritime trade, but this time the overall threat to Australia's maritime trade had been anticipated and addressed. A similar but far more effective campaign was mounted against Japan by the submarines of the USN

Pacific Fleet. Japan's failure to institute any protective measures until far too late in the war resulted in its maritime trade being destroyed and its economy and war making potential effectively being crippled.

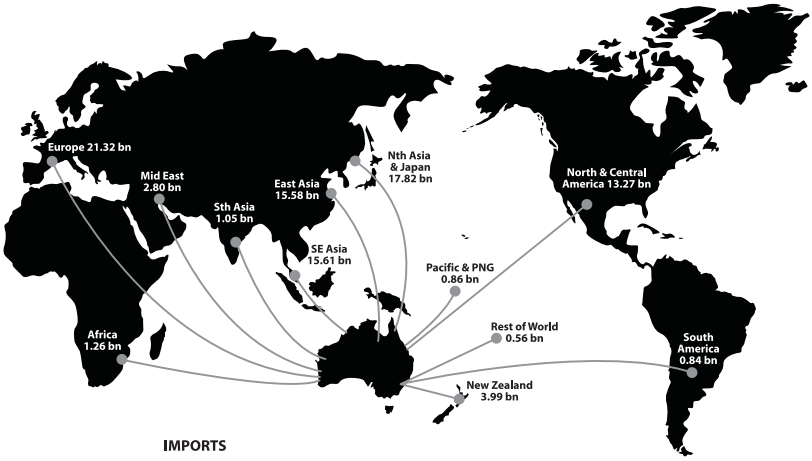
The principal lesson to be learned from Australia's war time experiences is that an aggressor can cause more damage, both in terms of naval resources that have to be allocated to meet the threat and also in terms of economic damage to Australia, from simply making sporadic attacks on maritime trade than from the physical losses inflicted by those attacks alone.

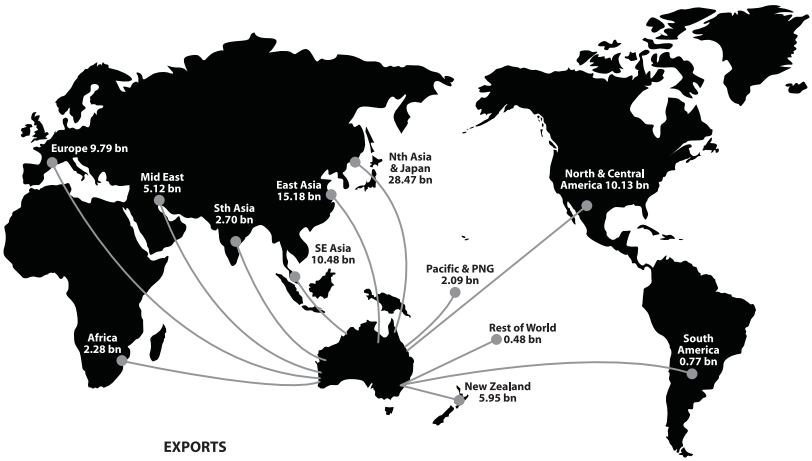
AUSTRALIA'S MARITIME TRADE

Even without counting the major cities of Sydney, Melbourne and Brisbane, most of Australia's population is located in the southeastern portion of the continent or is scattered in urban settlements, the majority of which are on or close to the coast. Land transport links outside that southeastern portion and away from the eastern coast are sparse and in many places rudimentary. Whilst the nation's air transport links are excellent, they cannot be used to transport anything other than comparatively small, high value cargoes. Consequently, economic and geographic realities dictate that shipping must be used to transport most cargoes both around the country and overseas.

Australia's international export trade is heavily focused towards North East Asia, whilst imports are more broadly focused from Europe, Asia and North America: 99.9% by weight and 73.5% by value of all imports and exports moved by sea in 2002-03. The following diagram shows the total value of all international freight imported and exported by Australia during 2002-03, according to the region of origin and final destination.

In 2003-04, seven of Australia's top ten export commodities were primary products. Australia's leading commodity export by value was coal followed by gold, iron ore, crude petroleum, meat, aluminium, wheat and passenger motor vehicles. By weight, exports of coal and iron ore dominated. Together, the top ten commodities listed in the table below accounted for 43 per cent of total merchandise exports in 2003-04. The major import commodity by value was passenger motor vehicles followed by crude petroleum, computers, medicaments, telecommunications equipment, aircraft and parts, and by weight, petroleum products and chemicals. Japan was Australia's largest trading partner for imports and exports by value, followed by China and the United States (US). Our closest neighbours Indonesia, New Zealand and Papua New Guinea remained important trading partners for Australia.





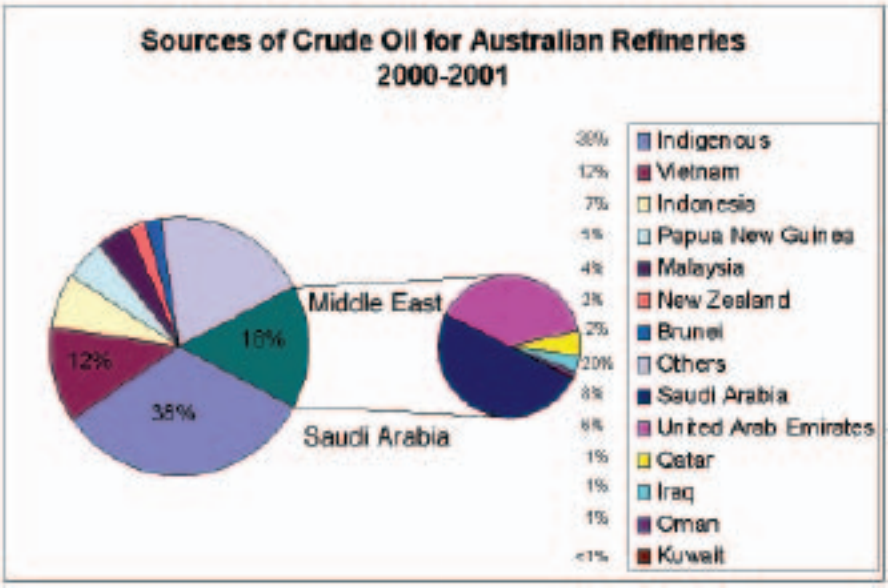
International Freight by Region of Origin / Final Destination, 2002-2003 ($billion)

Source: Reproduced in Bureau of Transport and Regional Economics 'Waterline' issue 38 - March 2005

Coal	$10.9 billion
Gold	$5.7 billion
Iron ore	$5.2 billion
Crude petroleum	$4.6 billion
Bovine meat	$4.0 billion
Aluminium	$3.8 billion
Aluminium ores	$3.7 billion
Wheat	$3.4 billion
Passenger vehicles	$2.9 billion
Alcoholic beverages	$2.6 billion

Australia's Principal Merchandise Exports – 2003-04

Australia, in common with most nations, no longer maintains large stockpiles of raw materials or manufactures all essential goods. 'Just in time' ordering of motor vehicle spare parts, heavy duty vehicles, computers and telecommunications equipment means that few goods in these categories are held in stockpiles of any size in Australia. Such stockpiles of manufactured goods usually contain no more than two weeks supply. Consequently, Australia relies on continued access to imports of such commodities not only for new equipment but, perhaps more importantly, for spare parts in order to keep current equipment operational. Australia imports some 60% of its domestic crude oil requirements and only holds up to approximately 50 days supply of unrefined crude oil, and in the order of 18 days petrol and diesel supplies at its oil refineries and terminals. Australia consumes 20 million barrels of oil every 26 days.



Sources of Crude Oil

Source: Australian Institute of Petroleum

The Australian registered merchant fleet now comprises approximately 46 ships (>2000 deadweight tonnes) with less than 20 being regularly engaged in international trade.

Threats to Maritime Trade

The need for a nation to defend its seaborne trade is scarcely new. Traditionally, threats to a nation's merchant shipping have only come from foreign navies and pirates. However, the attack on the French supertanker MV *Limburg* off the coast of Yemen in 2002 demonstrated that well-organised, well-financed and highly motivated terrorist organisations can and will attack shipping if it suits their aims.

The nature of the threat from another State is quite different to that of pirates or terrorist organisations. An attack by a State on another nation's maritime trade may occur either via blockade or as part of a guerre de course. The attacker's objective is to seriously damage or cripple its opponent's economy by denying it essential imports, or the opportunity to ship its exports to their intended destinations. Whilst blockade usually requires the commitment of significant resources, the benefit of a guerre de course to the enemy is that a smaller force is able to exert a disproportionate effect on a larger force, as many ships and aircraft must be tasked to locate and neutralise one attacker.

Technological developments since WWII, especially nuclear powered submarines, cruise missiles, surveillance satellites and long-range maritime strike aircraft, mean that it is no longer feasible to send 'fast' merchant ships on independent voyages in the hope that they will remain undetected or evade hostile forces.

Terrorist organisations may attack merchant ships and port installations with a view to obtaining both recognition of their organisation and causing collapse of the target nation's social structure. The method of attack could range from smuggled explosives to suicide bombers, or use of small, fast attack boats (possibly remote controlled or even underwater vehicles), aircraft or other vehicles; but regardless of the actual method employed, the elements of surprise and ingenuity will almost certainly be on display. Targets are often selected as much for their location and shock value, such as the 1985 MV *Achille Lauro* incident, or the potential impact of their hazardous cargo, as for their relationship with the nation being attacked.

While the short-term economic effect on Australia of any interruption to maritime trade would be immediately apparent at the national level, it would be felt most acutely at the local level. In the medium to long-term the effect would be profound and would be felt nationwide, through loss of reputation for reliability and stability, which would then likely lead to higher import costs and a loss of export markets. This in turn would affect the nation's balance of payments, its gross national product, and levels of employment, causing other flow-on effects such as increased domestic costs and a commensurate drop in consumption. The government would inevitably come under strong pressure to respond swiftly and decisively. It is thus vital that Australia both appreciates the nature of its maritime trade and maintains the capability to protect it.

LIMITATIONS

Resources

The major limitation will always be a lack of adequate resources, not only in terms of maritime protection forces but also in terms of administration. The comparatively small, and vastly dispersed, population of Australia, which has made it so reliant on maritime trade in the first place, also means that there will never be enough resources to concurrently protect all shipping and all ports.

Mixed Nationality

Few ships of any size today have a crew with a common nationality or ownership. It is quite common for a ship to be owned by one country, chartered by another, registered in another, with a multinational conglomeration of officers and crew. Tensions can easily arise between segments of a crew, due to misunderstandings based on language as well as cultural differences. This disparity in crewing and ownership arrangements has inevitably resulted in less synergy between navies, which remain mono-cultural and nationally focused, and merchant fleets.

Flags of Convenience

Australia is not in a position to place ships carrying its trade under naval control to protect them from maritime-based threats. Most of Australia's maritime trade is not carried in Australian owned or operated shipping, but is carried in ships registered under a flag of convenience. Accordingly, some of the options for protection may be more illusory than real.

Merchant Ship Design

Broadly speaking, what one average sized merchant ship is capable of carrying today, required between five and ten merchant ships during WWII. One consequence of increased size is a corresponding reliance on such ships for trade. The removal of one such ship for military or national purposes may not only cause cargo congestion at the ports it serves, but in some cases it could bring trade to a complete halt. Many ships today are built to carry specific cargoes on designated routes, using the bunkers available on those routes. For example, a ship may be designed to carry bulk ore on one leg, be in ballast on a second leg, carry another type of ore on a third leg, and have a short ballast leg back to the starting point. The ship's dimensions may be designed around the ports the ship will visit and also be equipped with engines designed to burn the fuel available at those ports.

Sea Lines of Communication and Choke Points

Merchant shipping to and from Australia follows set trade routes. Due to Australia's geographic location, its coastal population centres, and the arc of islands and coral reefs that stretch from Australia's north west to almost due east, most sea lines of communication cannot be altered and pass through one of half a dozen choke points around the Australian coast. Whilst it is convenient to refer to the geographic concepts of trade routes and choke points, it is the ships – not the water they sail on – that are vulnerable to attack and must be protected.

Strategic Ports

Various ports around Australia are crucial to particular trades. Some cargoes, such as containers, can be handled by most ports; some, such as crude oil, at a few ports, whilst others require specialised equipment and handling that can only be found at perhaps one port. The more specialised the cargo, generally speaking, the fewer the number of ports which will be capable of handling that cargo. Therefore, the loss of the port handling a specialised trade, such as Port Kembla and its associated steelworks, can mean the loss to Australia of almost all its trade in steel products. Australia's most important ports by value of goods transhipped are:

- **Sydney, NSW**
    - imports – motor vehicles, industrial machinery, telecommunication and sound equipment, computer equipment, paper and refined petroleum products; and
    - exports – animal food preparations, aluminium products, copper and copper alloy, paper, metal scrap, wool, beef, beverages.
- **Melbourne/Geelong, VIC**
    - imports – motor vehicles and parts, industrial machinery, power generating machinery, apparel, oil, animal food preparations and organic chemicals; and
    - exports - dairy, cereal, paper, cereal preparations, motor vehicles, wool, beverages, beef, sheep and goat meat.
- **Dampier, WA**
    - exports - iron ore, gas, oil, salt.
- **Newcastle, NSW**
    - exports - coal, cereals, copper and copper alloys, aluminium products
- **Hay Point, QLD**
    - export - coal.
- **Port Hedland, WA**
    - exports - iron ore, iron products, salt.
- **Gladstone, QLD**
    - exports - coal, alumina, cereals, aluminium products, pulpwood.
- **Port Wallcott, WA**
    - export - iron ore.

Australia's Major Ports and Rail Links

Strategic Cargoes

Some cargoes, such as oil, are always considered 'strategic', as are other essential cargoes where there are low stockpiles. However, almost any cargo can become 'strategic' if its failure to arrive or depart carries with it the very real possibility of serious, long-term economic consequences. For example, aluminium smelters are time-consuming and expensive to shut down and restart. If a cargo of alumina ore does not arrive, closure of the smelter may adversely affect the economy of an entire region for a considerable period of time. Similarly, the failure of a petrol tanker to arrive at a regional port may not only result in fuel disruptions in the port and immediately surrounding areas, but it may cause such delays to crop harvesting that the harvest is either significantly reduced in value, or completely lost. Accordingly, the negative flow-on effect of disruptions to strategic cargoes highlights the need to ensure the free movement of trade.

Legal Considerations

Masters, charterers and owners of merchant ships are usually neither legally required to accept naval guidance nor, even if threat levels are high, obliged to accept an escort or to form or remain in a convoy. At the height of the Battle of the Atlantic in WWII, masters of merchant ships were known to race ahead of their convoy or deliberately slow down and break with the convoy, even though the benefits of the convoy system in that operational environment were by then well known. Masters of merchant ships will be more inclined to comply with naval guidance if they can be assured of the improved chances of a safe passage and if their owners or charterers are convinced that they will suffer adverse economic consequences such as higher insurance rates or loss of markets if they do not comply.

THE RAN'S CAPABILITY TO DEFEND AUSTRALIA'S MARITIME TRADE

As part of its mission to fight and win in the maritime environment, the RAN is required to be capable of conducting combat operations in defence of merchant shipping and to undertake such other measures as are necessary to protect that shipping.

Naval Cooperation and Guidance for Shipping

Naval Cooperation and Guidance for Shipping (NCAGS) is the term now applied to a wide variety of measures aimed at protecting Australia's maritime trade. These procedures were described as Naval Control of Shipping in *Australian Maritime Doctrine* (AMD). NCAGS measures are designed to be attractive to the maritime industry in a voluntary environment yet still flexible and effective enough to protect ships at sea and in port.

Most RAN officers are not trained to understand merchant shipping operations and maritime trade in any detail. Accordingly, the RAN Reserve has long maintained a specialist Maritime Trade Operations (MTO) branch, staffed by officers with experience in the maritime industry, to advise on a broad range of matters connected with the merchant marine, maritime trade and NCAGS procedures. The MTO branch was previously called the Naval Control and Protection of Shipping organisation, as outlined in AMD.

Types of Protection

Protection of merchant shipping can take a number of forms:

- advice and guidance, including briefings on possible threats, provision of updated charts and information on port clearance procedures;
- passive protection, such as defensive routing advice and active monitoring; and
- active protection, including movement control, communications reporting gates near choke points, escorting or convoying.

The higher the level of protection it provides, the more resources, administrative as well as operational, and planning which will be necessary, and thus the greater the responsibility and legal liability the RAN will be taken to have assumed for the merchant ship, its crew and cargo.

Monitoring the Sea

In order for the RAN to be able to protect Australia's maritime trade at sea, it must acquire and maintain the capability to monitor all merchant shipping within Australia's sphere of influence, as well as all shipping outside that area which is of interest to Australia. This can be achieved in a variety of ways such as direct reporting by ships in accordance with the *International Ship and Port Facility Security* (ISPS) *Code*, remote identification and tracking, and obtaining data from purely military sources. In addition, the *Australian Maritime Identification System* (AMIS) is expected to be developed towards the end of 2005, and will act as a framework for combining, analysing and managing existing information on vessel identity, crews, cargoes and ship movements to support Australia's maritime security needs.

The Joint Offshore Protection Command (JOPC) was established in March 2005 as a more effective civil-military arrangement that increases deterrence efforts through maritime domain awareness and patrolling activities that are scalable in response to changing threat levels. To that end, the JOPC is charged with leading the inter-agency development of the AMIS and subsequent management of this tool to improve maritime domain awareness. It is clear from these arrangements that the RAN will continue to play an integral part in national efforts to strengthen maritime security offshore.

Escort by Warship

The traditional form of active protection given to a nation's merchant shipping has been by means of naval escort. This was most clearly seen in WWI and WWII, where Allied convoys were routinely protected from enemy submarines, aircraft and surface raiders by escorting warships. This type of protection is limited by the number of RAN warships available at any given time with the necessary sensors and weapons to detect and neutralise a threat, and is also constrained by the fact that most of our trade does not travel in merchant ships flying the Australian flag.

International Networks

Australia's maritime trade cannot be said to be adequately protected if the threat to merchant shipping has simply been kept away from Australia's maritime zones. Protection can only be deemed adequate if goods leave their port of departure and arrive at their destination in a timely fashion. Australia cannot single-handedly protect its trade outside its own sphere of influence, and it therefore relies upon existing inter-naval trade protection arrangements with the United States Navy and other forums known as Shipping Working Groups. Membership of these arrangements enables Australia to protect its trade internationally and to assist allied nations in protecting theirs.

NATO Operation Active Endeavour

NATO began Operation Active Endeavour in the Eastern Mediterranean on 26 October 2001 as part of the international campaign against terrorism, to demonstrate NATO resolve and solidarity. The operation was subsequently extended to the whole Mediterranean. Ships of voluntarily participating nations report their movements to the NATO Shipping Centre, and this information is passed to patrolling warships. Maritime insurance premiums decreased substantially after this operation commenced, demonstrating the benefits of active protection to shipping even in the face of an asymmetric threat.

Protection in and out of Ports

The adequate defence of ports, harbours, anchorages and associated infrastructure is essential if maritime trade is to be adequately protected. The need to protect merchant ships and their cargoes does not stop at the harbour entrance, for the ships must be protected while berthed and their cargoes protected until it has left the general area of the port. In smaller ports this general area is usually the wharf itself, but in larger ports the area requiring protection may extend inland for some distance and, in the case of crude oil imports or gas exports, may blend into vital infrastructure which needs protection in its own right.

Responsibility for security of Australia's ports rests initially with port authorities and then primarily with State governments and the police. In a defence emergency, or if called upon to aid the civil authority, the ADF would assist as required. In such circumstances the RAN could provide assistance in any one or more of the following ways:

- teams of specialist personnel familiar with the various ports, types of merchant ships using the ports, and the nature of the maritime trades in which those ships are engaged. These teams, drawn from the RAN's MTO branch, are tasked to monitor all merchant ships in Australian ports, advise RAN and ADF commanders on the commercial or economic consequences of any threat to those ships or ports, the manner in which the port and ships concerned operate, and the nature of the trades which may be potentially affected;

- mine countermeasure vessels and Clearance Diving Teams (CDTs) to locate and neutralise all mines and to guard against remotely controlled underwater vehicle and swimmer attacks; and

- contributing to mobile harbour defence teams tasked as required to provide port security and fixed asset protection.

Hub and Feeder Ports

Most trades, but particularly those relating to bulk ore, oil and containers, are now operating on the principle of hub ports and feeder ports. Australia's regional hub port is Singapore. The main feature of this development is that hub ports become very large indeed, as does the transport and associated infrastructure surrounding them, and feeder ports become increasingly reliant on a hub port. One practical effect of such centralisation is that it will become progressively easier for just one well-placed and well-timed attack on a port to have greater regional economic and political consequences than was possible in the past. This suggests that a cooperative approach to protection of hub ports and feeder ports may be required during periods of high threat. The RAN already conducts regular exercises with the Singaporean Navy to enhance its ability to operate collectively against this common threat.

FUTURE TRENDS

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- Australia's future security environment will remain fluid and our national interests will remain global.
- Developments in doctrine, technology, ship design and personnel employment will be critical to maximising the ability of the RAN to respond to future national security challenges.

Predicting the future, even over a short period, is difficult, and major security crises and events can arise with surprisingly little warning and have unforeseen long-term ramifications. The collapse of the Soviet Union, the invasion of Kuwait in 1990, and the terrorist attack on the World Trade Centre on 11 September 2001 all occurred without warning and significantly impacted on Australia's security planning. Based on events over the last decade, and knowledge of evolving threats and challenges, *Headmark 2025*, the RAN's strategic plan, predicts that the future security environment, and Australia's military interests will remain fluid, characterised by a wide range of issues and tensions across the spectrum of conflict. Australia's national interests will be diffused across the world, although our key interests will remain in the Asia-Pacific region. The sea lines of communication to Australia will remain critical to the nation's economic development. As a result, the RAN must be ready to respond globally wherever Australia's interests lie.

TECHNOLOGICAL DEVELOPMENTS

Of the many developments that must be considered, trends in technology, weapons, threats, material sciences and personnel are at the forefront of the factors influencing future capability. Computing, communications, nanotechnology and biotechnology are developing at a rapid rate, creating both risks and opportunities for the RAN. Technology will provide opportunities for the RAN to increase the speed, precision, lethality and reach of ships, aircraft and weapons systems, but the proliferation of affordable technology will also offer similar opportunities to potential adversaries, particularly non-State groups. Flexibility, survivability and training will be key factors in maintaining the edge.

Warship Design

Developments in warship design will help to shape the future of RAN capability, doctrine and training. Stealth technology is being progressively incorporated into naval units of all sizes, and future RAN warship designs will take such features into consideration. Unconventional hull forms, such as multi-hulls, are also under development, and the RAN's experience of operating the fast catamaran HMAS *Jervis Bay (II)* during the East Timor operations between 1999-2001 will be incorporated into future design considerations. Advanced propulsion systems, including Air Independent Propulsion systems for submarines, will also need to be assessed and their benefits carefully evaluated in forthcoming projects for the replacement of major RAN capabilities.

Given the increasing emphasis on the security of national and international shipping and cargoes, future warships need to be designed with escort and interdiction duties in mind. RAN warships must be able to keep pace with merchant ships, especially the faster vessels such as container and passenger ships, and to manoeuvre around such ships. This will influence the design of hulls and propulsion systems. Warship design and acquisition processes will become leaner and faster with potential advantages arising from greater flexibility to meet the demands of specific operations, reduced research and development timeframes, and the increasing use of commercially available technologies. The fundamental differences between the design of warships and commercial shipping, especially in areas such as survivability, will remain a challenge.

Materials Technology

Developments in material sciences are also expected to be significant. In an effort to reduce maintenance costs, the development of improved materials and coatings with increased strength and durability will enable more efficient maintenance procedures. Additional tactical benefits will also be realised, as advanced hull coatings, polymer injection systems and active sound quietening are likely to assist in the management of the acoustic and magnetic signatures of ships and submarines. Development of alternative or improved propulsion systems will provide increased range and manoeuvrability whilst reducing maintenance and operating costs. The need to be compliant with environmental regulations will also be a significant factor in this area.

Communications Technology

While sensor capabilities will improve significantly through advances in signal processing, the biggest advances in capability will be gained in the short to medium term through the revolution in sensor data and information networking. The near term introduction of the highly capable Link 16 system to the surface combatants will provide an incremental increase in capability; a quantum improvement will be achieved with the introduction of advanced capabilities such as Cooperative Engagement Capability in the Air Warfare Destroyer (AWD). Perhaps more revolutionary than the introduction of these systems is the very rapid introduction of wide area command and control tools such as secure web-based chat rooms and information exchange systems. These systems have become fundamental to Coalition force operations since the beginning of this decade and are currently being fitted to all RAN surface combatants. The merging of new and existing information, intelligence, sensor data and command and control tools over the next decade into a fully networked system, will create in the RAN's surface combatants the critical nodes of the ADF's maritime network centric warfare (NCW) capability.

Training Technology

Another significant trend will be the introduction into service of capable On Board Training Systems (OBTS), which will enable high fidelity warfare training to be conducted between geographically dispersed units, shore based training systems and OBTS-fitted coalition forces. OBTS systems will enable RAN ships to maintain a considerably higher level of core skill competency across all warfare areas than has been possible in the past.

Weapons Technology

Advances in traditional warfare areas due to evolving technology will force changes in both offensive and defensive tactics. Continuing evolution of traditional missile, gun and torpedo systems to incorporate alternate guidance systems including new generation active and passive seekers and a range of destructive mechanisms can render platforms and their systems ineffective until a counter development is achieved.

The ability to achieve an effect using electronic systems is a capability that does not necessarily require access to carefully regulated explosive materials. The coming years are likely to see the availability of directed energy weapons and their use not only for strategic purposes, but also in a more tactical sense which is an area of significant concern for the surface combatant force.

Whilst continuing to keep pace with advancing conventional threat capabilities RAN units will also have to cope with the burgeoning asymmetric threats and must be capable of defeating small and unconventional attacks which may include devices with radiological, chemical and biological agents.

As technology improves the capability to deliver weapons in a faster and more accurate way, so to does the requirement to assimilate a situation in a more timely and accurate manner. This assimilation process can take numerous forms, but in a warfare sense this describes a tactical or common operating picture. Optimising this requires all available information to be represented appropriately to the decision-makers. Whatever the source of the information there must be assurance of validity and understanding of variance, tolerances and the 'systems' limitations. Current network centric tactical systems are focussed on the more volatile air picture. The above water domain is relatively well understood. Future developments will move towards coordinating a tactical air, surface and sub-surface picture and presenting this in an integrated format for the command team.

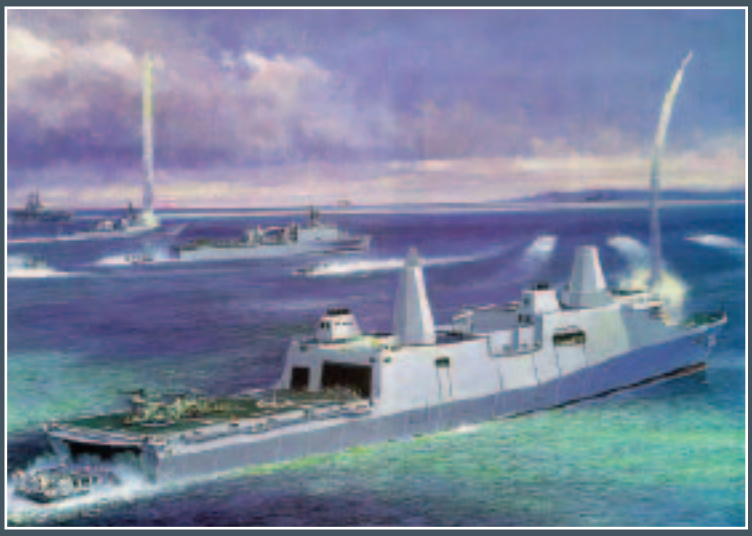
The obvious challenge is being able to filter the vast quantity of available information whilst taking measures to prevent adversaries disrupting or confusing our situational awareness of the picture compilation process. The likely overflow of information may also increase confusion and result in either an incorrect judgement or a delayed one. The management of information is one of the biggest challenges to be overcome.

A warship's ability to disrupt an adversary's common operating picture is likely to become increasingly important to success in warfare. The use of electronic support and electronic attack systems will evolve with threat systems. The use of information warfare will also increase as the reliance upon information systems becomes more and more an intrinsic part of the operator's resources.

Future extended range gun munitions and other guided weapons able to reach inland in excess of 60nm (111km) will provide a much wider and flexible range of options for both fire support and strategic strike. The regional proliferation of enhanced anti-shipping and land attack missiles will both increase the range of threats to Australia's security, and provide possible options for enhancing our own capabilities.

Sensor Technology

The past decade has seen the advent of some potent new tools in naval warfare. Processing power, software engineering and communications have between them facilitated the deployment of a variety of sensors that in the past may have been theoretically feasible, but were technically unachievable. Synthetic aperture radar, virtual sonar arrays, superconducting magnetic anomaly detectors, forward looking infra-red (FLIR) sensors, geo-location systems, low probability of intercept sonar, low-frequency active/passive sonar, and multi-statics (combining data from multiple sonars) are increasing the options and challenges for navies. When combined as a network of above and below water sensors, linked through the information, sensor and engagement grids, they potentially offer a new dimension of capability. The RAN will work to integrate these technologies, and counters to them, into its equipment, operational doctrine, and training systems.



Environmental Intelligence Systems

The RAN is developing a range of cutting edge environmental intelligence systems, to assist in forecasting conditions necessary for the conduct of maritime operations. A world-leading sonar propagation tactical decision aid, combined with a high resolution, relocatable oceanographic model capable of forecasting sea temperature, salinity and ocean currents, will permit the forecasting of sonar conditions out to in excess of a week. A mine warfare command support system will provide the necessary tools and information to enable the planning, controlling, assessment and analysis of mine warfare operations. An enhanced acoustic performance prediction system will improve the performance of high frequency mine warfare sonars. A local area wave forecasting computer model will improve the planning of amphibious operations.

Additional military layers (AML) are sets of military environmental data which form a comprehensive picture of the environmental situation. These are critical to the planning and conduct of maritime operations. AML are a NATO-led initiative to provide standardised collections of digital military geospatial information. AML can be used stand-alone or in conjunction with official navigational charts on compatible electronic chart navigation systems, in combination with other data in command and control systems, or on other environmental display and data systems. The data contained in AML may be updated in the field and redistributed as necessary, providing specific, up-to-date information to enhance tactical awareness.

Airborne Electromagnetic Bathymetry (AEMB) systems detect and interpret the secondary magnetic field induced in the seabed from an electro-magnetic pulse radiated from an aircraft, helicopter or Uninhabited Aerial Vehicle (UAV). Unlike laser-based depth sounding systems, AEMB is not affected by water clarity. While AEMB cannot achieve the levels of accuracy or feature detection required for nautical charting purposes, it has potential use for rapid environmental assessment (REA) where time, accessibility, water conditions or other factors preclude more accurate systems being deployed.

Uninhabited Vehicle Technology

Probably the most significant new capability to complement RAN forces is the introduction of Uninhabited Vehicles as part of core organic capabilities. These are likely to be a combination of aerial, underwater and surface platforms, which can be tasked to perform a large variety of functions. Whilst these options are still being explored they are expected to include surveillance, reconnaissance and command and control roles across the spectrum of ADF maritime operations and may also in due course provide an offensive capability.

Uninhabited Aerial Vehicles

An emerging capability is the use of UAV at sea to complement traditional aircraft support. UAVs are particularly beneficial when threat conditions are known and the risk to human assets is high, or if terrain or shallow water restricts the use of surface units. The UAV may carry sensor 'packages' including inverse synthetic aperture radar, FLIR and/or Electronic Support Measures and will provide real-time data link information to the command team on the parent vessel to inform tactical decision making. UAVs will vary in size, complexity and cost from relatively short range, short endurance expendable vehicles to long range, high endurance fixed-wing, rotary-wing and/or hybrid vehicles carrying multiple sensors.

The utilisation of UAVs for military operations, including REA, has developed quickly in recent years. UAVs are advantageous when time is limited or information is required quickly. UAVs have the capability of extended time on task or reaching an objective at extended range, and they can be fitted with a variety of intelligence collection systems.

The operation of UAVs from RAN ships and facilities is not new. As early as the mid-1930s RAN cruisers operated the De Havilland Queen Bee remotely piloted target aircraft, and the Jindivik remotely piloted target was also successfully operated by the RAN from the late 1950s to 1998. The major differences between these early UAVs and the modern generation are the increased sophistication and miniaturisation of control systems, endurance, and greatly improved sensor and communication packages. Thus,

instead of being limited to providing targets for RAN surface warship weapons systems, they are capable of being integrated into the broader surveillance network. The AWD will likely be the first surface platform to incorporate UAVs in the sensor suite, however Australian Army UAVs may operate on autonomous missions from other ships in the next few years.

Uninhabited Underwater Vehicles

Uninhabited Underwater Vehicle (UUV) technology is no longer the domain of academia and is now being used as a technologically and financially viable solution for many underwater tasks including survey, anti-submarine warfare (ASW) and mine countermeasure applications. Whether in a survey or an REA role, the UUV has similar advantages to a UAV in expanding a sensor net, particularly in high-threat areas where crewed vessels would be operating at an unacceptable level of risk. The RAN will monitor the development of Australian and international developments in UUV technology, such as the Defence Science and Technology Organisation developed *Wayamba* system, to determine the suitability of such systems for integration into its operational capability.

Uninhabited Surface Vehicles

Remotely operated surface vehicles have been used by navies for decades, primarily in the MCM role, to conduct precursor operations, pre-sweeping of mines in advance of crewed minesweepers. The RAN has operated three 7-metre drone boats in this role for some years. Several navies are currently developing Uninhabited Surface Vehicles (USV) equipped with sensors and weapons systems to conduct intelligence, surveillance and reconnaissance (ISR), force protection, ASW, hydrography, logistic support, precision strike, and rescue. For example, the USN is experimenting with prototype ISR equipped USV operated from major surface combatants to provide enhanced force protection against asymmetric threats from hostile small craft at fleet bases, ports and anchorages. Given the increasing focus on asymmetric threats to port facilities there is some potential for the RAN to extend its experience of USV operation from minesweeping precursor operations to other operations.

DOCTRINAL DEVELOPMENTS

Military doctrine is, by nature, a dynamic construct. As the nature of conflict changes, so doctrine evolves to incorporate new technologies, operational experience, and new ideas about how warfare is to be conducted. Evolving concepts derived from the experiences of other western militaries can also be vicariously adopted into Australian doctrine. As a result, RAN doctrine will continue to develop and evolve in the immediate future. Two significant developing areas of RAN doctrine are NCW and REA.

Network Centric Warfare

The move towards NCW is driving the RAN's command and control future. Future technologies, particularly advances in Information Technology, will enable a more distributed command structure for the ADF, but it is critical to remember that command is, and will always remain, a human function. Technology can be expected to change the way in which command is exercised, but the fundamentals will remain constant.

Advocates of NCW extol the virtues of precision and speed of response, value-added decision making, and information superiority. Yet naval warfare can be an inherently ponderous business; platforms, weapons and energy travel more slowly, and generally over shorter distances, underwater than they do above it. For this reason, the application of NCW in the naval environment becomes more an issue of how to fuse data to leverage the contribution of multiple sensors, than of merely faster, more accurate, decisions based on improved situational awareness. But for data fusion to work, communications must be effective. This is one of the biggest inhibitions to making NCW a reality in the maritime environment.

No military operation exists in a vacuum and, as Field Marshal Helmuth von Moltke noted, 'No plan of operation survives the first collision with the main body of the enemy'. The advocates of NCW can thus expect their concepts to be followed with the closest interest by potential adversaries and, even as the debate gathers pace, counters to the technologies will be under development. Historically there has been a very small lag between a new military technology or tactic and its counter. Indeed, the technology itself may be employed to attack the concept. Consequently, while NCW offers great opportunities for the RAN to seize the initiative over potential adversaries, it will not be a 'silver bullet'. The RAN will continue to balance these technologies with proven operational procedures and flexible training and education.

Rapid Environmental Assessment

The REA concept provides for the timely collection, analysis and dissemination of all environmental parameters of military significance. REA depends upon an organisation being able to access, update or collect data just ahead of, or during, operations. This must include field units capable of collecting data, often under hostile conditions. This in turn must be supported by reliable, fast and robust communications to distribute the resultant up-to-date information back to tactical commanders and operational units. Mobile REA field units would be deployed in advance of a force moving into an area of unknown hydrographic, meteorological and oceanographic conditions. The units would rapidly turn the data acquired into products to assist the following force. Development of the REA concept within the ADF is in its infancy but awareness of a need for an REA capability is gaining momentum. The RAN has embryonic REA field units within the HMFEG, and is contributing to the development of an integrated ADF REA capability.

PERSONNEL DEVELOPMENTS

Analysis of Australia's demographic trends suggests that national population growth will slow over the next few decades, and may even begin to decline. Combined with increased life expectancy, this will result in a shrinking and aging population. With a smaller youth pool from which to recruit, the RAN will be faced with greater difficulties in attracting and retaining the necessary quality of personnel necessary to operate technologically advanced platforms in modern conflict. The RAN will need to invest heavily in training and education to adequately prepare its personnel, as well as looking at innovative ways of using technology to reduce crew sizes and balance workloads.

Training and Education

In the past the ADF's training requirements were based on meeting single-Service demands, but the increasing prevalence of joint operations is refocussing training to enhance the ADF's corporate skills. Combined with the new equipment entering service during the next decade, this will provide the government with an enormously versatile military tool, ideally suited to Australia's unique strategic environment. Similarly, the need for highly skilled and adaptable personnel is driving the development of continuing civil education and joint military education for RAN personnel, particularly those identified as suitable for employment in higher management and leadership roles. This trend is likely to continue with increasing technological complexity of RAN units and greater personnel pressures.

Crew Size

The forecast pressures on the recruiting base will drive consideration of ways to reduce the size of crews for RAN ships and submarines. This will require changes in current personnel intensive methods for whole-of-ship activities, such as underway replenishment. Technology and automation may provide some assistance and permit additional reductions in crew size. However, alternative innovative methods may also need to be adopted, such as multi-crewing regimes. While crew reductions through automation are essential to reducing overheads at sea, and thereby making best use of scarce personnel resources, the process can only be taken to the point where the survival of a ship is not endangered. Sustained operations at higher levels of readiness require sufficient personnel to provide adequate watch rotation, to ensure necessary crew rest is obtained. Despite advances in automation, damage control operations also require a substantial crew response, particularly if combat operations must be conducted concurrently. This may result in a less than optimal solution in terms of strict efficiency to ensure the maintenance of an effective combat unit.

ANNEX – NAVY UNIT SPECIFICATIONS

Notes:

[1] Mk 46 ASW Torpedoes being replaced by MU90 torpedoes from 2006

[2] SM-2 SAM being acquired to replace SM-1, but not yet in service

SURFACE COMBATANTS

DESIG.	NAME/PENNANT NO.	COMM.	ARMAMENT	SPEED (Knots)	RANGE (nm @ Knots)	SHIPS CO.	DIMENSIONS (m) (length x beam x draft)	DISPL. (tonnes)	REMARKS
FFG	ADELAIDE (01) CANBERRA (02) SYDNEY (03) DARWIN (04) MELBOURNE (05) NEWCASTLE (06)	15/11/80 21/03/81 29/01/83 21/07/84 15/02/92 11/12/93	Harpoon SSM Standard SM-1 SAM 76mm Rapid Fire Gun Phalanx CIWS Mk 46 ASW Torpedoes[1] .50 cal Machine guns	30 kn	4,500 @ 20 kn	186-210	138.1 × 13.7 × 7.5	4100	2 x S-70B-2 Seahawk Helicopters with Mk 46 ASW Torpedoes[1]
FFG Upgrade	SYDNEY, MELBOURNE, DARWIN and NEWCASTLE to be upgraded. ADELAIDE and CANBERRA to be decommissioned in 2006.	before 2008	Harpoon SSM Standard SM-2 SAM[2] Evolved Sea Sparrow SAM 76mm Rapid Fire Gun Phalanx CIWS MU90 Torpedoes (from 2006) .50 cal Machine guns	30 kn	4,500 @ 20 kn	186-210	138.1 × 13.7 × 7.5	4200	2 x S-70B-2 Seahawk Helicopters with Mk 46 ASW Torpedoes[1]
FFH	ANZAC (150) ARUNTA (151) WARRAMUNGA (152) STUART (153) PARRAMATTA (154) BALLARAT (155) TOOWOOMBA (156) PERTH (157)	13/05/96 12/12/98 28/03/01 17/08/02 04/10/03 26/06/04 Due 7/05 Due 6/06	Evolved Sea Sparrow SAM 5 inch (127 mm) Rapid Fire Gun Mk 46 ASW Torpedoes[1] .50 cal Machine guns Harpoon capability was installed on WARRAMUNGA in 2004, the remaining FFHs to be progressively upgraded (FFHs will be the first RAN units capable of firing Harpoon Block II. RAN is converting inventory of Block I to Block II from late 2005).	27 kn	6,000 @ 18 kn	161 +/- (a/crew)	118 × 14.8 × 4.35	3600	1 x S-70B-2 Seahawk Helicopter with Mk 46 ASW Torpedoes[1] or 1 x SH-2G(A) Super Seasprite Helicopter with Penguin ASM (not yet in service)

ANNEX – NAVY UNIT SPECIFICATIONS

AMPHIBIOUS MANOEUVRE

DESIG.	NAME/PENNANT NO.	COMM.	ARMAMENT	SPEED (Knots)	RANGE (nm @ Knots)	SHIPS CO.	DIMENSIONS (m) (length x beam x draft)	DISPL. (tonne)	REMARKS
LPA	MANOORA (L52) (ex-Fairfax County) KANIMBLA (L51) (ex – Saginaw)	25/11/94 (16/10/71 in USN service) 29/08/94 (23/01/71 in USN service)	1 x Phalanx CIWS 6 x .50 cal Machine guns SRBOC self-defence system	20 kn	14,000 @ 15kn	182	159.2 × 21.2 × 5.3	8,534 full load	2 x LCM8 Landing Craft Hangar for 3 x Sea King or 4 x Blackhawk helicopters Troop capacity 400
LSH	TOBRUK (L50)	23/04/81	4 x .50 cal Machine guns	16 kn	8,000 @ 15 kn	145	126 × 18 × 4.9	5,800 full load	2 x LCM8's as deck cargo 2 x LCVP on davits 2 x Sea King helicopters (1 if LCM8 embarked) Troop capacity 315 (520 for short periods) Carrying capacity: 18 x Leopard tanks, 24 x trucks, or 16 x shipping containers
LCH	BALIKPAPAN (L126) BRUNEI (L127) LABUAN (L128) TARAKAN (L129) WEWAK (L130) BETANO (L133)	27/09/74 05/01/73 09/03/73 15/06/73 10/08/73 08/02/74	2 x .50 cal Machine guns	9 kn	3,000 @ 10 kn (unloaded) 2280 with 150t load	13	44.5 x 10.1 x 2	316 standard	Troop capacity 400 (ship-to-shore) Carrying capacity: 2 x Leopard tanks 13 x APC or 23 x trucks

ANNEX – NAVY UNIT SPECIFICATIONS

AFLOAT SUPPORT

DESIG.	NAME/PENNANT NO.	COMM.	ARMAMENT	SPEED (Knots)	RANGE (nm @ Knots)	SHIPS CO.	DIMENSIONS (m) (length x beam x draft)	DISPL. (tonne)	REMARKS
AOR	SUCCESS (OR 304)	23/04/86	2 x Phalanx CIWS (FFBNW)[1] 4 x.50 cal Machine guns	19 kn	8,616 @ 15 kn	220	157.2 × 21.2 × 8.6	17,933 full load	1 x Sea King helicopter 5,000 tonnes diesel fuel, 1,175 tonnes aviation fuel, 140 tonnes water, as well as ammunition, weapons and provisions.
AO	WESTRALIA (O195)	11/79 (to be replaced by SIRIUS)	2 x Phalanx CIWS (FFBNW) 2 x .50 cal Machine guns	17 kn	7260 @ 15 kn	84	171 × 26 × 11.9	40,870 full load	1 x Utility (Aircraft) 25,000 tonnes diesel fuel, 4,700 tonnes aviation fuel 1,400 tonnes water
AO	SIRIUS	Due 7/06	TBA	15 kn	TBA		176 x 31 x 9	37,000 approx.	1 x helicopter landing pad 40,000 tonnes diesel fuel, as well as aviation fuel and water

Notes:
[1] Fitted for but not with

ANNEX – NAVY UNIT SPECIFICATIONS

SUBMARINES

DESIG.	NAME/PENNANT NO.	COMM.	ARMAMENT	SPEED (Knots)	RANGE (nm @ Knots)	SHIPS CO.	DIMENSIONS (m) (length x beam x draft)	DISPL. (tonne)	REMARKS
SSG	COLLINS (73) FARNCOMB (74) WALLER (75) DECHAINEUX (76) SHEEAN (77) RANKIN (78)	27/07/96 31/01/98 10/07/99 23/02/01 23/02/01 29/03/03	Mk 48 Torpedoes UGM-84 (std variant) Sub Harpoon Missiles	> 20 kn submerged > 10 kn surfaced / snorting	9,000 @ 10 kn (snort); 11,500 @ 10 kn (surfaced) 400 @ 4 kn (dived)	46	77.2 × 7.8 × 7	3,248 submerged; 3,046 surfaced; 2,676 standard displacement.	Submarine upgrade programme in progress: Replacement Combat System (RCS); Weapons upgrade to Mk 48 Mod 7 ADCAP torpedo; UGM-84 (later variant) Sub Harpoon Missile; Platform, communications, signature, sensor and HMI improvements; Special forces modifications.

ANNEX – NAVY UNIT SPECIFICATIONS

PATROL BOATS

DESIG.	NAME/PENNANT NO.	COMM. /DEL.	ARMAMENT	SPEED (Knots)	RANGE (nm @ Knots)	SHIPS CO.	DIMENSIONS (m) (length x beam x draft)	DISPL. (tonne)	REMARKS
FCPB	FREMANTLE (203) WARRNAMBOOL (204) TOWNSVILLE (205) WOLLONGONG (206) LAUNCESTON (207) WHYALLA (208) IPSWICH (209) CESSNOCK (210) BENDIGO (211) GAWLER (212) GERALDTON (213) DUBBO (214) GEELONG (215) GLADSTONE (216) BUNBURY (217)	17/03/80 14/03/81 18/07/81 28/11/81 01/03/82 03/07/82 13/11/82 05/03/83 28/05/83 02/08/83 10/12/83 10/03/84 02/06/84 08/09/84 15/12/84	1 x 40/60 Bofor gun 2 x .50 cal Machine guns	27 kn	1450 @ 27 kn 2360 @ 12 kn	24	42 × 7.15 × 1.8	220	Paying off commences Jun 05 (CESSNOCK), completes Feb 07 (GLADSTONE).
ACPB	ARMIDALE (83) LARRAKIA (84) BATHURST (85) ALBANY (86) PIRIE (87) MAITLAND (88) ARARAT (89) BROOME (90) BUNDABERG (91) WOLLONGONG (92) CHILDERS (93) LAUNCESTON (94)	06/05 09/05 10/05 01/06 02/06 05/06 06/06 09/06 10/06 02/07 02/07 05/07	1 x 25mm naval stabilised deck gun 2 x .50 cal Machine guns	25 kn	3000 @ 12 kn Endurance 90 days.	21	56.8 x 9.68 x 2.25	305	Note: Government has announced that a further 2 x ACPBs will be procured. Multi-crewing commences mid 06 (6 crews per 4 boats in 3 Divisions).

ANNEX – NAVY UNIT SPECIFICATIONS

MINE WARFARE AND CLEARANCE DIVING

DESIG.	NAME/PENNANT NO.	COMM.	ARMAMENT	SPEED (Knots)	RANGE (nm @ Knots)	SHIPS CO.	DIMENSIONS (m) (length x beam x draft)	DISPL. (tonne)	REMARKS
MHC	HUON (82) HAWKESBURY (83) NORMAN (84) GASCOYNE (85) DIAMANTINA (86) YARRA (87)	15/05/99 12/02/00 26/08/00 02/06/01 04/05/02 01/03/03	1 x 30 mm DS30B Rapid fire cannon 2 x .50 cal Machine guns	14 kn	1700 @ 12 kn	38	52.5 × 9.9 × 3.0	720	2 SUTEC Double Eagle Mine Disposal Vehicles with DAMDIC CD equipment and detachment Influence and Magnetic tows
CDT	AUSCDT ONE AUSCDT THREE - (dormant) AUSCDT FOUR	22/09/01 Since 1951 01/12/01	Specialist transportable Hyperbaric and Diving support equipment						Based Sydney, NSW (Formed and deployed for specific operations) Based Garden Island, WA
MSA	BANDICOOT WALLAROO	8/90 8/90	Nil	11 kn	4490 @ 11kn	9	29.2 x 8.5 x 3.43	450	Auxiliary Minesweepers (Large)

ANNEX – NAVY UNIT SPECIFICATIONS

NAVAL AVIATION UNITS

SQUADRON	ROLES	AIRCRAFT	BASE	REMARKS
723 SQN	Aircrew basic rotary wing training	13 x AS-350BA Squirrel	Nowra, NSW	One of the 13 aircraft is an attrition spare.
805 SQN	Support for Anti-Surface Warfare embarked helicopters & Operational Flying Training (OFT)	5 x SH-2G(A) Super Seasprite	Nowra, NSW	10 Aircraft delivered to Australia. Eleventh aircraft remains in the USA to complete systems testing, to be delivered in 2006.
		6 x SH-2G(A) Super Seasprite	ANZAC Frigates	
816 SQN	Support for Anti-Submarine Warfare embarked helicopters & OFT	10 x S-70B-2 Seahawk	Nowra, NSW	816 SQN is required to provide up to two detachments per year (in addition to the six ADELAIDE Flights) to support ANZAC Frigates.
		6 x S-70B-2 Seahawk	ADELAIDE Frigates	
817 SQN	Support for Maritime Support embarked helicopters & OFT	5 x Sea King Mk50A/B	Nowra, NSW	817 SQN is required to provide up to two detachments per year to support LPA/LSH operations.
		1 x Sea King Mk50A/B	HMAS SUCCESS	

ANNEX – NAVY UNIT SPECIFICATIONS

AIR ASSETS

TYPE	ASSET	NORMALCRUISE SPEED	MAXIMUM TAKE- OFF WEIGHT(kg)	CREW	ARMAMENT
S-70B-2	Sikorsky Seahawk	250 kph	9473	3	Up to 3 Mk 46 Torpedoes[1]; or 2 x Mk11 Depth Charges. 7.62 Machine gun (door mounted)
SK50A/B	Westland Sea King	176 kph	9525	4	2 x Mk 46 Torpedoes[1]; or 2 x Mk11 Depth Charges. 7.62 Machine gun (door mounted)
SH-2G(A)	Kaman Super Seasprite	222 kph	6441	2	2 x Penguin Anti-ship missiles; or 2 x Mk 46 Torpedoes[1]; or 4 x Mk 11 Depth Charges. 7.62 Machine gun (door mounted)
AS-350BA	Eurocopter Squirrel	222 kph	2100	2 to 4	Nil

Notes:
[1] Mk 46 ASW Torpedoes being replaced by MU90 torpedoes from 2006.

ANNEX – NAVY UNIT SPECIFICATIONS

HYDROGRAPHIC

DESIG.	NAME/PENNANT NO.	COMM. /DEL.	ARMAMENT	SPEED (Knots)	RANGE (nm @ Knots)	SHIPS CO.	DIMENSIONS (m) (length x beam x draft)	DISPL. (tonnes)	REMARKS
AGS	LEEUWIN (A245) MELVILLE (A246)	27/05/00 27/05/00	.50 cal Machine guns	> 12 kn	8000 @ 12 kn	56	71.1 × 15.2 × 4.4	2550	Multibeam echo sounder Forward looking sonar Side Scan sonar Single beam echo sounder 3 x Survey Motor Boats (each with independent hydrographic survey system)
AGSC	PALUMA (A01) MERMAID (A02) SHEPPARTON (A03) BENALLA (A04)	27/02/89 04/12/89 24/01/90 20/09/90		11 kn	3500 @ 11 kn	13	36.6 × 13.7 × 1.9	320	Single beam echo sounder (planned upgrade to include a Multibeam echo sounder). Forward looking sonar Hull Mounted Side Scan sonar
LADS FLIGHT	System installed in F27-500 Fokker Friendship	delivered1993		Transit speed – 220 kts. Survey speed – 145 kts at survey height of 500m.	Approx. 600nm (allowing for a minimum of 2 hours on sounding task. Maximum time on task of 7.5 hrs).	2 survey crew 2 con-tract a/crew			LADS supported by civilian contract pilots LADS Flight consists of 7 RAN personnel and 9 contractors.

ACRONYMS AND ABBREVIATIONS

AAW	Anti-Air Warfare
ACPB	*Armidale* Class Patrol Boat
ADDP	Australian Defence Doctrine Publication
ADCAP	Advanced Capability
ADF	Australian Defence Force
ADFP	Australian Defence Force Publication
ADO	Australian Defence Organisation
AEMB	Airborne Electromagnetic Bathymetry
AEW&C	Airborne Early Warning and Control
AGS	Hydrographic Survey Ship
AGSC	Hydrographic Survey Ship Coastal
AHO	Australian Hydrographic Office
AMD	*Australian Maritime Doctrine: RAN Doctrine 1 - 2000*
AMIS	Australian Maritime Indentification System
AML	Additional Military Layers
AO	Oiler
AODC	Australian Oceanographic Data Centre
AODCJF	Australian Ocean Data Joint Facility
AOR	Replenishment Oiler
ARE	Amphibious Ready Element
ARG	Amphibious Ready Group
ASL	Archipelagic Sea Lanes
ASLP	Archipelagic Sea Lanes Passage

ASW	Anti-Submarine Warfare
ASUW	Anti-Surface Warfare
AW	Air Warfare
AWD	Air Warfare Destroyer
C4I	Command, Control, Communications, Computers and Intelligence
CA	Chief of Army
CAF	Chief of Air Force
CANSC	Commander Australian Navy Systems Command
CDF	Chief of the Defence Force
CDT	Clearance Diving Team
CIWS	Close In Weapon System
CJOPS	Chief of Joint Operations
CN	Chief of Navy
CO	Commanding Officer
COMFLOT	Commodore Flotillas
CPD	CDF Preparedness Directive
CSG	Combat Support Group
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTG	Commander Task Group
DACC	Defence Assistance to the Civil Community
DCN	Deputy Chief of Navy
DGST	Deployable Geospatial Survey Team
DJFHQ(M)	Deployable Joint Force Headquarters (Maritime)
DLOC	Directed Level of Capability
DMO	Defence Materiel Organisation
DOM	Directorate of Oceanography and Meteorology
EBO	Effects Based Operations
EEZ	Exclusive Economic Zone

EOD	Explosive Ordnance Disposal
ESSM	Evolved Sea Sparrow Missile
FAA	Fleet Air Arm
FCPB	*Fremantle* Class Patrol Boat
FEG	Force Element Group
FFG	Guided Missile Frigate/s
FFH	Helicopter Capable Frigate/s
FLIR	Forward Looking Infra-red
FPDA	Five Power Defence Arrangement
FWOC	Fleet Weather and Oceanography Centre
GIS	Geographical Information System
HMAS	Her/His Majesty's Australian Ship / Submarine
HMFEG	Hydrographic, Meteorological and Oceanographic Force Element Group
HMS	Her/His Majesty's Ship
HQ JOC	Headquarters Joint Operational Command
ILS	Integrated Logistic Support
IMO	International Maritime Organisation
ISPS	International Ship and Port Facility Security Code
ISR	Intelligence, Surveillance and Reconnaissance
JOC OPR	Joint Operations Command Operational Preparedness Requirements
JOPC	Joint Offshore Protection Command
km	Kilometre/s
LADS	Laser Airborne Depth Sounder
LARC-V	Lighter Amphibious Resupply Cargo – Mark V
LAT	Lowest Astronomical Tide
LCH	Landing Craft Heavy
LCM8	Landing Craft Mechanised - Mark 8

LCVP	Landing Craft Vehicle and Personnel
LOAC	Law of Armed Conflict
LOSC	*1982 UN Law of the Sea Convention*
LPA	Amphibious Transport - Personnel
LSD	Dock Landing Ship
LSE	Logistic Support Element/s
LSH	Landing Ship Heavy
m	metre/s
mm	millimetre/s
MC	Maritime Commander
MCD	Mine Warfare and Clearance Diving
MCM	Mine Countermeasures
METOC	Meteorology and Oceanography
MGI	Military Geospatial Information
MHC	Coastal Minehunter
MHQ	Maritime Headquarters
MTO	Maritime Trade Operations
MV	Motor Vessel
NAS	Naval Air Station
NATO	North Atlantic Treaty Organisation
NAVSYS	Navy Systems Branch
NCAGS	Naval Cooperation and Guidance for Shipping
NCAMO	*The Navy Contribution to Australian Maritime Operations: RAN Doctrine 2 - 2005*
NCW	Network Centric Warfare
NGS	Naval Gunfire Support
NHQ	Navy Headquarters
nm	Nautical Mile/s

NSW	New South Wales
NT	Northern Territory
NTRS	Naval Technical Regulatory System
NWOC	Naval Air Station Weather and Oceanography Centre
OBTS	On Board Training System/s
OFT	Operational Flying Training
OMC	Operational METOC Centre
PMS	Preparedness Management System
POW	Prisoner/s of War
QLD	Queensland
RAAF	Royal Australian Air Force
RAN	Royal Australian Navy
RAS	Replenishment at Sea
REA	Rapid Environmental Assessment
RN	Royal Navy
ROE	Rules of Engagement
SA	South Australia
SAM	Surface to Air Missile
SLOC	Sea Lines of Communication
SMB	Survey Motor Boat
SMS	*Seine Majestat Schiff* (His Majesty's Ship) – German WWI designation
SSG	Guided Missile Submarine
SSM	Surface to Surface Missile
SUW	Surface Warfare
TAS	Tasmania
TCOMD	Theatre Command
TE	Task Element
TF	Task Force

TG	Task Group
TU	Task Unit
TWC	Tactical Warfare Commander/s
UAV	Uninhabited Aerial Vehicle/s
UK	United Kingdom
UN	United Nations
US	United States
USN	United States Navy
USV	Uninhabited Surface Vehicle/s
UWW	Underwater Warfare
UUV	Uninhabited Underwater Vehicle/s
VCDF	Vice Chief of the Defence Force
VIC	Victoria
WA	Western Australia
WWI	World War One
WWII	World War Two

GLOSSARY

SOURCES

ADDP 3.2	Australian Defence Doctrine Publication 3.2 – Amphibious Operations (2003)
ADDP D.4	Australian Defence Doctrine Publication D.4 – Joint Warfighting (2003)
ADFP 04.1.1	Australian Defence Force Publication 04.1.1 – Glossary
AMD	Australian Maritime Doctrine (RAN Doctrine 1 – 2000)
BR 1806	British Maritime Doctrine (Third Edition – 2004)
JP1-02	Dictionary of Military and Associated Terms, USA Doctrine (2004)
JP3-13.1	Joint Doctrine for Command and Control Warfare (C2W), USA Doctrine (1996)
LOSC	United Nations Law of the Sea Convention (1982)
LWP G 0-1-6	Australian Army Land Warfare Procedures – General – Glossary of Army Operational and Tactical Terms (2002)
NATO	NATO Glossary of Terms and Definitions, AAP-6 (2005)

Note: Where no source is shown in brackets after the title, the origin of the definition is RAN Doctrine 2 - 2005.

Access (AMD)

The ability to approach and manoeuvre to achieve military aims within a designated environment.

Additional Military Layers

A unified range of digital geospatial data products designed to meet the needs of defence users for situation awareness.

Amphibious Operation (ADDP 3.2)

A military operation launched from the sea by naval and landing forces embarked on ships or craft with the principal task of landing forces ashore tactically into an environment ranging from the permissive to the hostile in order to accomplish the assigned mission:

a. Planning—The period extending from issuance of the initiating directive to assault.

b. Embarkation—The period during which the forces, with their equipment and supplies, are embarked in the assigned shipping.

c. Rehearsal—The period during which the prospective operation is rehearsed for the purpose of:

   (1) testing adequacy of plans, the timing of detailed operations, and the combat readiness of participating forces;

   (2) ensuring that all echelons are familiar with plans; and

   (3) testing communications.

d. Movement—The period during which various components of the amphibious task force move from points of embarkation to the objective area.

e. Assault—The period between the arrival of the major assault forces of the amphibious task force in the amphibious objective area and the accomplishment of the amphibious task force mission, ie the amphibious mission.

f. Termination—The completion of securing of amphibious objective.

Anti-Air Warfare (NATO)

Measures taken to defend a maritime force against attacks by airborne weapons launched from aircraft, ships, submarines and land-based sites.

Anti-Submarine Warfare (NATO)

Operations conducted with the intention of denying the enemy the effective use of their submarines.

Anti-Surface Warfare

Measures taken to defend a maritime force against attacks by surface based weapons launched from ships and land-based sites.

Archipelago (LOSC)

A group of islands, including parts of islands, interconnecting waters and other natural features which are so closely interrelated that such islands, waters and other natural features form an intrinsic geographical, economic and political entity, or which historically have been regarded as such.

Archipelagic Baselines (LOSC)

Straight lines joining the outermost points of the outermost islands and drying reefs which may be used to enclose all or part of an archipelago forming all or part of an Archipelagic State.

Archipelagic Sea Lanes Passage

Sea-lanes and air routes designated by an Archipelagic State that are suitable for continuous and expeditious passage of foreign ships and aircraft in their normal mode of operation through or over its archipelagic waters and the adjacent territorial sea.

Archipelagic State (BR 1806)

An independent State consisting entirely of an archipelago of islands.

Archipelagic Waters (BR 1806)

Waters over which an Archipelagic State claims sovereignty under the LOSC.

Asymmetric Threat (NATO)

A threat emanating from the potential use of dissimilar means or methods to circumvent or negate an opponent's strengths while exploiting his weaknesses to obtain a disproportionate result.

Availability (ADFP 04.1.1)

The situation wherein a system or equipment is in a condition which permits its operation to its full capacity or within prescribed parameters; expressed as either:

a. the number or percentage of systems or equipment under discussion at a specific time, or

b. the percentage of the number of hours the systems or equipment should be normally available for use during a stated period.

Baseline (LOSC)

The line from which the seaward limits of a State's territorial sea and certain other maritime zones of jurisdiction are measured.

Blockade (BR 1806)

An operation intended to disrupt the enemy's economy by preventing ships of all nations from entering or leaving specified coastal areas under the occupation and control of the enemy. Blockade is an act of war and the right to establish it is granted to belligerents under the traditional laws of war. This law requires, inter alia, that the blockade must be effective, that it is to be declared by the belligerent so that all interested parties know of its existence and that it is confined to ports or coasts occupied by the enemy. The expression is used more broadly to mean a combat operation carried out to prevent access to, or departure from the coast or waters of a hostile State.

Capability

The ability of a trained and equipped individual or organised force to effectively achieve an assigned mission, task or function

Chain of Command (NATO)

The succession of Commanding Officers from a superior to a subordinate through which command is exercised.

Choke Points

Relatively narrow shipping lanes which are vulnerable to closure by force.

Coastal State

A State Party within the terms of the LOSC with a coastline under its lawful jurisdiction.

Combined (ADFP 04.1.1)

Between two or more forces or agencies of two or more allies. When all allies or Services are not involved, the participating nations and Services shall be identified, eg. Combined Navies. See also joint.

Command (ADFP 04.1.1)

The authority which a commander in the military Service lawfully exercises over subordinates by virtue of rank or assignment. Command includes the authority and responsibility for effectively using available resources and for planning the employment of, organising, directing, coordinating and controlling military forces for the accomplishment of assigned missions. It also includes responsibility for health, welfare, morale and discipline of assigned personnel.

Command and Control (AMD)

The processes through which a commander exercises command (whether full or operational or tactical command) or operational or tactical control to organise, direct and co-ordinate the activities of the forces allocated to him or her.

Commanding Officer

The officer in command of a warship, other military unit or formation.

Contiguous Zone (ADFP 04.1.1)

In a zone contiguous to its territorial sea, described as the contiguous zone, the coastal State may exercise the control necessary to:

a. prevent infringement of its customs, fiscal, immigration or sanitary laws and regulations within its territorial sea; and

b. punish infringement of the above laws and regulations committed within its territory or territorial sea.

The contiguous zone may not extend beyond 24 nautical miles from the baselines from which the breadth of the territorial sea is measured.

Continental Shelf (AMD)

An area of the seabed and the subsoil adjacent to the coast but beyond the territorial sea in which the coastal State has sovereign rights for the purpose of exploration, control and exploitation of the living and natural resources. The extent of the area can be defined by formulae developed by LOSC.

Control (NATO)

The authority exercised by a commander over part of the activities of subordinate organisations, or other organisations not normally under his or her command, which encompasses the responsibility for implementing orders or directives. All or part of this authority may be transferred or delegated.

Corrective Maintenance (ADFP 04.1.1)

Maintenance actions carried out to restore a defective item to a specified condition.

Customary International Law

Those laws that represent the long-standing and consistent practice among most States with respect to a particular subject and which are accompanied by the belief of such States that the practice is obligatory. A long-continued practice acquiesced in by other States may create customary international law irrespective of the intent of those States. A State, as a member of the community of nations, may therefore be said to have tacitly consented to it. Customary international law is one of the principal sources of international law.

Doctrine (ADFP 04.1.1)

Fundamental principles by which military forces or elements thereof guide their actions in support of national objectives. It is authoritative but requires judgement in application.

Effects Based Operations

The application of military and other capabilities to realise specific and desired outcomes in peace, tension, conflict and post-conflict situations.

Enabling Group

A group of the Australian Defence Organisation that provides enabling services to Defence output groups through purchaser-provider arrangements.

Endurance (NATO)

The time an aircraft can continue flying or a ground vehicle or ship can continue operating under specified conditions, eg without refuelling.

Exclusive Economic Zone (ADFP 04.1.1)

An area beyond and adjacent to the territorial sea, subject to the specific legal regime established in part V of LOSC, under which the rights and jurisdiction of the coastal State and the rights and freedoms of other States are governed by the relevant provisions. The EEZ shall not extend beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured.

Feeder Port

A port of a lesser economic value that feeds into major arterial trade routes, joining the main stream of container traffic that feeds into neighbouring hub ports.

Flag State

A State that registers ships and assumes jurisdiction under its domestic law for those ships. A ship must fly the flag of its flag State.

Flag of Convenience

A flag State in which a ship has been registered only to gain some financial or legal advantage.

Focal Area

A trade route, or a confluence of such trade routes, whose geographic features are such that it can be closed or controlled with comparative ease, to strategic effect.

Force Multiplier (AMD)

A platform, system or other entity with latent capabilities which, when applied in conjunction with other assets, has a multiplier effect on applied capability. For example, underway replenishment ships have a force multiplier effect on surface combatant capability.

Force Protection

Actions taken to prevent or mitigate hostile actions against the ADO. Force protection does not include actions to defeat the enemy or protect against accidents, weather, or disease.

Full Command (NATO)

The military authority and responsibility of a commander to issue orders to subordinates. It covers every aspect of military operations and administration and exists only within national Services. Note: the term 'command' as used internationally, implies a lesser degree of authority than when it is used in a purely national sense. No international or coalition commander has full command over the forces assigned to him/her.

Guerre de Course (AMD)

A campaign directed at the merchant shipping of the enemy. It may have the intent of achieving leverage by damaging international trade or be an outright effort to cut off supplies to the enemy's domestic economy.

High Seas (BR 1806)

All parts of the sea which are not included in the territorial seas or internal waters of States. All States have the freedom to navigate or conduct other activities, subject to certain restrictions, on the high seas. Where States have declared other zones beyond the territorial sea (contiguous zone, exclusive economic zone, continental shelf), the traditional high seas freedoms are affected by the rights that coastal States can exercise in such zones.

Hot Pursuit (ADFP 04.1.1)

The pursuit by a government ship or aircraft of a foreign vessel from a coastal State's internal waters, territorial seas or contiguous zone on to the high seas, for the sole purpose of effecting its arrest for a violation of the laws and regulations of the coastal State. Pursuit must be commenced contemporaneously with the offence committed; it must be pressed with all possible dispatch (ie it must be 'hot') and it must be continuous although one pursuer may be relieved by another. The right of hot pursuit ceases when the pursued enters the territorial seas of its own or a third State.

Hub Port

A port is situated at the intersection of arterial trade routes where the main stream of container traffic splits into feeder ports.

Hydrography (ADFP 04.1.1)

The science which deals with the measurements and description of the physical features of the oceans, seas, lakes, rivers and their adjoining coastal areas, with particular reference to their use for navigational purposes.

Indiscretion Rate

An indication of the potential for a conventional submarine to be detected while on or near the sea surface, being the ratio of time recharging batteries to that discharging the batteries.

Information Warfare (JP3-13.1)

Actions taken to achieve information superiority by affecting adversary information, information-based processes, information systems, and computer-based networks while defending one's own information, information-based processes, information systems, and computer-based networks.

Innocent Passage

Passage undertaken by ships that is not prejudicial to the peace, good order, or security of a coastal State. Innocent passage is undertaken through the territorial sea of a coastal State for the purpose of either traversing that sea without entering internal waters, or of proceeding in either direction between the high seas and internal waters. Ships have the right to take innocent passage through territorial seas without interference by the coastal State concerned.

Internal Waters (AMD)

All waters actually within the territory of a State such as harbours, rivers and lakes; together with all other waters to landward of the baseline from which the State's territorial sea is measured. They are an integral part of the territory of the State in which the laws of the land apply with little exception.

Joint (AMD)

Connotes activities, operations, organisations, etc in which elements of more than one Service of the same nation participate. (When all Services are not involved, the participating Services shall be identified, eg Joint Army-Navy).

Joint Force (ADFP 04.1.1)

A general term applied to a force which is composed of significant elements of the Navy, Army and Air Force, or two or more of these Services, operating under a single commander who is in turn directly responsible to the Chief of the Defence Force.

Jus Ad Bellum

The body of customary international law containing the legal rules relating to the right of States to have recourse to the use of force in international relations.

Jus In Bello

The body of customary international law containing the legal rules dealing with the conduct of States and combatants during armed hostilities, otherwise simply known as 'the law of war'.

Law of Armed Conflict (ADFP 04.1.1)

The international law regulating the conduct of States and combatants engaged in armed hostilities. Often termed 'the law of war'.

Layered Defence (BR 1806)

The disposition of protective assets possessing a mixture of anti-submarine, anti-surface and anti-air capabilities in layers of screens and patrol areas about units of high value or crucial waters.

Littoral (AMD)

The areas to seaward of the coast which are susceptible to influence or support from the land and the areas inland from the coast which are susceptible to influence or support from the sea.

Logistics (NATO)

The science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, those aspects of military operations which deal with:

a. design and development, acquisition, storage, movement, distribution, maintenance, evacuation and disposition of materiel;

b. transport of personnel;

c. acquisition or construction, maintenance, operation and disposition of facilities;

d. acquisition or furnishing of services; and

e. medical and health service support.

Logistic Support Element

A task element deployed forward to coordinate the logistic support of units in theatre.

Lowest Astronomical Tide

The lowest tide level which can be predicted to occur under average meteorological conditions under any combination of astronomical conditions.

Manoeuvre Warfare (AMD)

A war-fighting philosophy that seeks to defeat the enemy by shattering their morale and physical cohesion – their ability to fight as an effective, co-ordinated whole – rather than by destroying them physically through incremental attrition.

Maritime Doctrine (AMD)

That component of doctrine which sustains the employment of armed forces at and from the sea.

Maritime Operation (NATO)

An action performed by forces on, under or over the sea to gain or exploit control of the sea or to deny its use to an enemy.

Maritime Power Projection (AMD)

The ability to project, sustain and apply effective military force from the sea in order to influence events on land.

Maritime Strategy (AMD)

The comprehensive direction of all aspects of national power to achieve national strategic goals by exercising some degree of control at sea.

Master (Mariner)

The captain of any merchant vessel, irrespective of size, qualified to take command by passing a professional examination for a master's ticket.

Meteorology

The science of understanding the weather.

Military Geospatial Information

Geospatial information which is necessary for military planning and operations.

Military Objectives (ADFP 04.1.1)

Military objectives are legitimate objects of attack and comprise:

a. all combatants who have a capacity and are willing to fight;

b. establishments, buildings and locations at which the armed forces or their materiels are located; and

c. other objects which, by their nature, location, purpose or use make an effective contribution to military action and whose total or partial destruction, capture or neutralisation, in the circumstances ruling at the time, offers a definite military advantage.

The presence of non-combatants in or around a military objective does not change its nature as a military objective. Non-combatants in the vicinity of a military objective must share the danger to which the military objective is exposed.

Minehunting (NATO)

The employment of ships, airborne equipment and/or divers to locate and dispose of individual mines.

Minesweeping (NATO)

The technique of searching for, or clearing mines using mechanical or explosion gear, which physically removes or destroys the mine, or produces, in the area, the influence fields necessary to actuate it.

Mine Warfare (NATO)

The strategic and tactical use of mines and their counter-measures.

Mission Command (ADDP-D.4)

A philosophy of command and a system for conducting operations in which subordinates are given a clear indication by a superior of their intention. The result required, the task, the resources and any constraints are clearly enunciated, however subordinates are allowed the freedom to decide how to achieve the required result. The term 'directive control' is synonymous but is being replaced by mission command.

Mobility (NATO)

A quality or capability of military forces which permits them to move from place to place while retaining the ability to fulfil their primary mission.

Naval Cooperation and Guidance for Shipping (BR 1806)

The provision of military cooperation, guidance, advice, assistance and supervision to merchant shipping to enhance the safety of participating merchant ships and to support military operations.

Naval Gunfire Support (AMD)

Gunfire provided by surface combatants in direct support to operations ashore.

Naval Technical Regulatory System

A system controlling risk, during design, construction and maintenance, that is likely to affect fitness for materiel service, safety and the environment and also requiring materiel to be designed, constructed and maintained to approved standards, by competent and authorised individuals who are acting as members of authorised organisations whose work is certified as correct.

Network Centric Warfare (ADFP 04.1.1)

The style of operations that can be undertaken by a networked force where the automatic and rapid transfer of information enables the most effective use of combat power and takes place when the force can operate as a single virtual network.

Normal Mode (of Operation)

The normal activities of warships and military aircraft, including but not limited to conducting weapons and other exercises, flying operations, military training, coastal surveillance and manoeuvres. This implies that submarines are operating submerged. Normal mode is employed outside the territorial sea and internal waters of a coastal State.

Oceanography

The science of understanding the physical properties of the ocean.

Operation (NATO)

A military action or the carrying out of a strategic, tactical, service, training, or administrative military mission; the process of carrying on combat, including movement, supply, attack, defence and manoeuvres needed to gain the objectives of any battle or campaign.

Operation Command (NATO)

The authority granted to a commander to assign missions or tasks to subordinate commanders, to deploy units, to reassign forces and to retain or delegate operational and/or tactical control as may be deemed necessary. It does not of itself include responsibility for administration or logistics. May also be used to denote the forces assigned to a commander.

Organic (AMD)

Capabilities that are borne within a naval force or formation. It is most frequently used in relation to ship-borne aircraft and helicopters, but can also refer to logistics, weapons and sensors.

Output Group

A Service or Group of the Australian Defence Organisation that is responsible for delivering outputs to government in accordance with the Portfolio Budget Statement.

Piracy

An act of boarding or attempting to board any ship on the high seas with the apparent intent to commit theft or any other crime and with the apparent intent or capability to use force in the furtherance of that act.

Point-Defence

The defence or protection of a single military unit.

Poise (AMD)

An attribute of seaborne forces which permits them to remain deployed and positioned for long periods such that they are able to influence events or withdraw at will without risk of embroilment.

Preparation

The process by which individuals, ships or units prepare for future military operations. For the RAN this includes the conduct of routine peacetime activities.

Preparedness

The ability to undertake maritime operations, the combination of readiness and sustainability.

Preventive Maintenance (NATO)

Systematic and/or prescribed maintenance intended to reduce the probability of failure.

Prisoners of War (ADFP 04.1.1)

Persons as defined in *The Third Geneva Convention Relative to the Treatment of Prisoners of War* (12 August 1949, Part 1, Article 4).

Rapid Environmental Assessment

The acquisition, compilation and release of tactically relevant environmental information in a tactically relevant time frame.

Reach (AMD)

The ability to operate for extended periods at considerable distance from shore support.

Readiness

A force's ability to be committed to operations within a specified time.

Reconstitution

The process by which individuals, ships and units reassume or recover to identified preparedness levels required by strategic policy.

Replenishment at Sea (NATO)

Those operations required to make a transfer of personnel and/or supplies when at sea.

Rules of Engagement

Directives issued by competent military authority which specify the circumstances and limitations under which forces will initiate and/or continue combat engagement with other forces encountered. Rules of engagement may also be employed to define the use of military force in situations short of actual combat.

Sea Basing (JP1-02)

In amphibious operations, a technique of basing certain land force support elements aboard ship which decreases shore based presence.

Sea Control

The condition that exists when one has freedom of action to use a maritime area for one's own purposes for a period of time and, if required, deny its use to an adversary. To be effective, control must be exercised over the air space above the sea, the water column and the seabed below it, and the electro-magnetic spectrum. To an increasing degree, it also includes consideration of space based assets.

Sea Denial

The condition that exists when one's adversary is denied the ability to use a maritime area for his own purposes for a period of time, without being able to exercise sea control oneself.

Sea Lines of Communication

The shortest navigable routes followed by shipping from their points of departure to their destinations. SLOCs may refer in military operations to the maritime supply routes between operational forces and their supporting bases. The term is also used to describe the major commercial shipping passages of the world. SLOCs do not have a physical existence and both the concept and SLOC defence must be considered in terms of the ships that use them rather than in the same way as lines of communication on land.

Service

One of the Armed Forces of the Commonwealth of Australia to which persons are appointed, enlisted, or inducted for military service, and which operates and is administered within the ADO. The Australian Services are the Royal Australian Navy, the Australian Army and the Royal Australian Air Force.

Sovereign Immune/Immunity

Immunity under the exclusive jurisdiction of the flag State and from the enforcement of another State's laws. It extends to warships, and government vessels and aircraft operated for non-commercial purposes.

States Parties (LOSC)

States which have consented to be bound by LOSC and for which LOSC is in force.

Status of Forces Agreement (LWP-G 0-1-6)

An agreement which defines the legal position of a visiting military force deployed in the territory of a friendly State. Agreements delineating the status of visiting military forces may be bilateral or multilateral.

Strategic Strike Operations (ADFP 04.1.1)

Offensive actions designed to effect the progressive destruction and disintegration of the enemy's capability to wage war.

Sustainability

A force's ability to continue to conduct operations, measured in terms of the personnel, equipment, facilities and consumables needed to complete assigned operational tasks.

Task Element (AMD)

The fourth and lowest level in which units are grouped within a task organisation. A task element may consist of only one ship or independent unit.

Task Force (NATO)

1. A temporary grouping of units, under one commander, formed for the purpose of carrying out a specific operation or mission.

2. A semi-permanent organisation of units, under one commander, formed for the purpose of carrying out a continuing specific task.

3. A component of a fleet organised by the commander of a task fleet or a higher authority for the accomplishment of a specific task or tasks.

Task Group (AMD)

The second highest level in a task organisation, a task group is a grouping of units under one commander subordinate to a task force commander, formed for the purpose of carrying out specific functions.

Task Organisation (AMD)

A command organisation in which the various units and formations are organised by task into task forces, task groups, task units and task elements.

Task Unit (AMD)

The third level in which units are grouped in a task organisation. A task group is normally divided into two or more task units according to the tasks required to be accomplished.

Territorial Sea (ADFP 04.1.1)

That area of sea over which a coastal State exercises sovereignty.

Theatre (ADFP 04.1.1)

A designated geographic area for which an operational level joint or combined commander is appointed and in which a campaign or series of major operations is conducted. A theatre may contain one or more joint force areas of operations.

Theatre Command

The authority given by CDF to CJOPS over assigned forces to prepare for and conduct campaigns, operations and other activities.

Transit Passage (AMD)

Freedom of navigation and overflight solely for the purpose of continuous and expeditious transit through straits used for international navigation.

Treaty Law

The obligations under a treaty that are legally binding in international law upon the States which have signed and ratified the treaty, provided a sufficient number of States have done so as required by the terms of the relevant treaty. A treaty is sometimes known as a convention or international agreement, and may be either bilateral or multilateral in nature.

Usage Upkeep Plan

A representation, in graphical form, of the ideal allocation of programmed maintenance availabilities within an upkeep cycle for ships of each particular class.

Water Column (LOSC)

A vertical continuum of water from sea surface to seabed.

Work-up (ADFP 04.1.1)

To train the officers and ships company of a newly commissioned, recently overhauled or refitted ship in their duties to operate and fight the ship.

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