



- Oceans Policy
- Legal Implications of Mine Warfare
- Minesweep System
- AE2
- Huon Class

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Defence Industry Forum (details to be advised)

Seminar Costs

The Seminar cost of \$250.00 includes lunch on both days and a copy of the Seminar Proceedings. A 10 % discount is available for group bookings of three or more. A formal dining-in night for seminar attendees and partners is being held on the night of Thursday, 16 November 2000, at the Officers Mess, Australian Defence Force Academy. Cost for the dinner is \$60.00 per person.

Registration Information/Expressions of Interest

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Back Cover – Is your TASO on watch?

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Editorial

Welcome to the first edition of the ANI Journal for 2000. While everyone I speak to is flat out and the year is flying by, a lot of people have still found the time to contribute quality articles for the Journal. This makes my job of compiling and editing easier and so for that I thank our contributors and urge others to take to their keyboards to discuss their area of expertise or interest with us all.

The focus for this edition is quite broad. There are several mine warfare related topics, Commodore Bateman has kindly allowed us permission to reprint his Bolton Lecture from last year and Graham Wilson has contributed the first in a series of three historical submarine articles. In addition Dr Mark Spencer has written a great personal narrative regarding his key involvement in the search for and discovery of the Australian submarine AE2. It makes for great reading.

By all accounts the Minehunter Coastal (MHC) Project has been an outstanding success. Commander Geoff Uren has contributed his impressions as HMAS

HUON'S commissioning Commanding Officer, which is complemented by a view from one of his junior officers about his time onboard.

In addition, Commodore Donohue discusses a new minesweep system, the legal implications of mine warfare are covered by Commanders Fitzpatrick and Stevens and the shot from the past this edition is particularly interesting in this our Olympic year.

Unfortunately, our attempts to establish a website and associated email addresses have not met with success. For those who have tried to contact me through the ani.org.au email address I apologise for your frustrations. Hopefully we will soon have a solution to make access to the ANI and this journal easier, but in the interim I can be contacted at mattrowe@bigpond.com.

I hope you enjoy this edition – it makes for some very interesting reading.

MATTHEW ROWE





Australia's Oceans Policy and the Maritime Community

The Annual Boulton Lecture 1999

Presented by the Company of Master Mariners of Australia in conjunction with the Navy League of Australia (NSW Division) in Sydney on Thursday, 30 September 1999.

*By Commodore Sam Bateman AM RAN (Rtd)**

Introduction

I am most honoured to have been invited by the Company of Master Mariners and the Navy League to deliver the 1999 Boulton Lecture. Through their publications and other promotional activities, these two organisations are eloquent and forceful members of the maritime community in Australia that do much to promote maritime awareness among the wider Australian community. This Boulton Lecture provides an excellent opportunity to share some ideas with you on Australia's new national oceans policy and to explain why this policy should be welcomed by everyone who has some interest in the oceans and Australia's maritime affairs.

Australia's Ocean Domain

Australia has one of the largest marine jurisdictions in the world and we are at the heart of the region of the world where maritime problems are most acute. Table 1 shows that Australia is entitled to an Exclusive Economic Zone (EEZ) around the continental land mass and island territories of 8.6 million square kilometres (mill.sq.km). This is one of the largest EEZs in the world and may be even the largest depending on the basis for comparison. Our EEZ increases in size to 11.1 mill.sq.km if the EEZ claimed around the Australian Antarctic Territory (AAT) is included as well. Australia also has a legal continental shelf of 12.3 mill.sq.km around the continent and territories (or 14.8 mill.sq.km if the one around the AAT is also included). These figures mean that the maximum marine area over which Australia has some sovereign rights and jurisdiction (i.e. 14.8 mill.sq.km.) is nearly twice the size of the continental land mass of Australia itself of 7.8 mill.sq.km.

These are sobering statistics, particularly if one goes even further and includes Australia's claim to the AAT land mass. Then Australia becomes the country in the world with the largest jurisdictional claim to an area of the earth's surface – approx 28.5 mill.sq.km of which about half is over ocean or sea. (Russia is second with a claim to the earth's surface of 21.5 mill.sq.km and the

United States is third with a claim of 20.0 mill.sq.km.) The AAT is nearly one half of our land territory but, even without this area where Australia's sovereignty is disputed by many countries, Australia would still rank second in terms of the area of earth's surface under some form of national jurisdiction.

Table 1

AUSTRALIA'S OCEAN DOMAIN

	Mill.sq.kms
EEZ	
Continent + Territories	8.6
Australian Antarctic Territory	2.5
Total	11.1

LEGAL CONTINENTAL SHELF

Continent + Territories	12.3
Australian Antarctic Territory	2.5
Total	14.8

TO BE COMPARED WITH:

Australia's Continental Land Mass	7.8
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Source: P A Symonds and J B Willcox, 'Australia's petroleum potential in areas beyond an Exclusive Economic Zone', *BMR Journal of Australian Geology and Geophysics*, Vol 11, No 1, Table 1, p.14.

Managing this large area of ocean poses a great challenge for Australia that cuts across State and Federal jurisdictions and involves the interests of the various sectors of industry that either use the sea or seek to exploit its resources.

The activity in recent years to develop a national oceans policy is well overdue as, despite being a large island continent with extensive maritime interests, Australia has focused much more in the past on continental concerns, particularly farming and mining, with scant attention to maritime issues. Or as Frances McGuire, the Australian naval historian, once noted, "(the Australian land mass) is so spacious that its inhabitants are inclined to acquire an outlook deceptively continental; placed on the map in its immense context of ocean, it displays its true insularity".

Although making great use of the sea and the beach for recreational purposes (swimming, surfing, sailing,



fishing, etc), Australians do not see themselves as maritime people, and it is often said that Australia lacks a maritime culture. Until comparatively recently, major sectors of Australia's marine industry, particularly shipping (including associated activities, such as stevedoring and towage) and fishing, were left largely in the hands of foreign interests. In periods in the past, marine industry, with the obvious exception of the service to trade provided by shipping, contributed relatively little to Australia's economic growth and prosperity. These have been driven mainly by primary industry from the earliest days of colonial settlement, and more recently, by mining, another mainly continental industry.

The impetus to lift the profile of maritime affairs and the oceans as important elements of public policy in Australia can be explained by several factors. First and most specifically, there is growing national (and political) awareness of the reality that Australia was one of the great "winners" with extensions to the national maritime domain allowed by the 1982 UN Convention on the Law of the Sea (UNCLOS).

A second factor that contributes to the new maritime emphasis in Australia is the recent success story for some sectors of Australia's marine industry, particularly offshore oil and gas, shipbuilding, fishing and marine tourism. The *Marine Industry Development Strategy*, released in 1997, shows that:

- About 90 per cent of Australia's oil and gas production is sourced from offshore areas with exports in 1995-96 estimated at about A\$2,474 million and accounting for nearly 40 per cent of total domestic production.
- The shipbuilding industry in Australia is highly export-oriented (exports account for about 85 per cent of the current production level of nearly A\$650 million per annum). It supplies about one third of the world's high speed ferry market.
- Wild capture fisheries now represent a major primary industry for Australia with exports in 1994-95 valued at A\$1,366 million. Although Australian waters are relatively unproductive in international terms, the fisheries that do exist are often of high value (eg, rock lobster and tuna). The share of aquaculture is already substantial with very good prospects for growth.
- Marine tourism had an export value of over two billion dollars in 1993-94 and, on the basis of past growth, is considered to have excellent prospects of further growth.

Lastly, the new focus on maritime affairs in Australia may be part of general public awareness of the ecological diversity of Australia, as well as an appreciation of the extent of Australia's territorial claim to land and marine areas. (The seminal and highly readable work on Australia's biodiversity is

Tim Flannery's *The Future Eaters*.) The Australian journalist, Paul Sheehan, writing in *The Sydney Morning Herald* on 16 August 1995 even went as far to argue that Australia has a claim to the status of an *ecological superpower*.

Australia has certainly been active in the area of the preservation and protection of the marine environment, including at the International Maritime Organisation (IMO). For example, Australia has been taking a strong stand at the IMO with the need for controls to prevent the introduction of foreign organisms through discharge of ballast water and compensation for oil-spill damage from ships other than oil tankers. Reasons for the strong Australian position on the preservation and protection of the marine environment are not hard to find:

- The Australian marine environment is relatively pristine and includes three areas currently on the World Cultural and National Heritage List - the Great Barrier Reef, Shark Bay and Fraser Island.
- Australia's exports are mainly bulk ores and grain, and thus Australia has a high demand for the services of bulk carriers which are generally regarded as the most sub-standard class of ship posing relatively higher risks to the marine environment than other classes of vessel. This is because of both their greater use of ballast water and their higher incidence of failure of Port State Control safety inspections.
- Shipping accidents in Australian waters, such as the KIRKI, an oil tanker which lost her bow off the coast of Western Australia in 1991, and the IRON BARON, an ore carrier which went aground off the coast of Tasmania in 1995, attract considerable media attention.

The development of management and legal regimes for using the oceans and seas of the world has received much attention in recent years. This is a result of the expansion of economic activities at sea, growing concern over the health of the world's oceans, excessive fishing, tensions between different uses of coastal and sea areas (ie, shipping and ports, dumping, aquaculture and fishing, tourism, etc) and the emergence of the idea of ecologically sustainable development (ESD) that treats all natural environments as interacting systems. It is now recognised that managing oceans on a purely sectoral basis (i.e. each industry sector and ocean user doing basically "its own thing") is dysfunctional with "a tyranny of small decisions". It does not recognise the "interconnectedness" of ocean uses and submerges the conflicts of interest that can emerge, particularly the basic tension that invariably arises between wealth creation interests (or economic uses) on the one hand and marine environmental protection on the other. Resolution of these problems may be facilitated by the over-arching framework of a national oceans policy.



Australia's Oceans Policy

The work to develop a national oceans policy for Australia was initiated in December 1995 when the (then) Prime Minister, Paul Keating, announced that the Commonwealth Government had agreed to a proposal for the development of a coordinated policy on the management of Australia's marine resource. Having included the idea of an oceans policy in its environment platform prior to the Federal election in March 1996, the incoming Howard Government assigned the responsibility to develop this policy to the (then) Department of Environment, Sport and Territories (DEST). After a lot of hard work and comprehensive public consultation, *Australia's Oceans Policy* was released by Senator Robert Hill, the Federal Minister for the Environment, in December 1998.

The objective of the new national oceans policy is to provide a strategic framework for the planning, management and ecologically sustainable development of Australia's fisheries, shipping, tourism, petroleum, gas and seabed resources while ensuring the conservation of the marine environment. At the core of the policy is the development of Regional Marine Plans, based on large marine ecosystems, which will be binding on all Commonwealth agencies. The first Regional Marine Plan will be developed for the south-eastern region of Australia's Exclusive Economic Zone. Broadly this will include waters off Victoria, Tasmania, southern New South Wales and eastern South Australia. The promulgation of *Australia's Oceans Policy* makes Australia the first country in the world to develop a comprehensive, national plan to protect and manage the oceans.

The marine science community played a strong role in advocating the need for a national oceans policy. A National Marine Science and Technology Plan was developed concurrently with *Australia's Oceans Policy* and the final version of this was released a few months ago. Marine scientists and technologists were certainly the most assertive of the disciplines and interest groups in promoting the importance of both their contribution to oceans policy and the need for such a policy. It will be important to ensure that this does not lead to a bias in the implementation of the policy towards marine science and away from other disciplines involved in oceans policy research. While marine scientific and technological research is essential for effective oceans management, it is equally essential that the necessary legal, economic, human resources, social and public policy research is conducted also.

Oceans policy has a role in balancing national interests and ensuring internationally that Australia does not lose more than it gains by new measures. Examples of potential conflicts of interest include, on the one hand, Australia's concern for the preservation and protection of the marine environment, and on the

other, Australia's interest in the freedom of navigation through the EEZ and archipelagic waters of other countries, and the exploration and exploitation of offshore resources. International rights and freedoms of navigation are important to Australia because of the dependence on seaborne trade and the fact that Australia is surrounded by archipelagic states to the Northwest, North and Northeast (reading from West to East: Indonesia and the Philippines through to Papua New Guinea, the Solomon Islands, Vanuatu and Fiji in the Pacific). Environmental concerns, legitimate or otherwise, are increasingly being used by coastal states to justify new controls over shipping and a sharp contrast exists, therefore, between our position on the importance of the freedom of navigation and our interest in the protection and preservation of the marine environment.

A focus on marine environmental protection is not necessarily at the expense of balanced, exploitative uses of the sea. These two interests are not mutually exclusive and there is a positive side to increased environmental concerns as far as the development of marine industry is concerned. This is both in terms of the general benefits of more effective management and legislation for ecologically sustainable development and in terms of some specific benefits that may result for industry. Not only are there direct opportunities with the demand for goods and services for marine environmental management, including the establishment of surveillance and monitoring arrangements, but indirect benefits could result through a shift in community perceptions against the relative environmental "unfriendliness" of some land-based industries. For example, seabed mining of sand and gravel may be preferable to utilisation of land quarries and beaches, and greater use could be made of coastal shipping because it is more energy efficient and with markedly less Greenhouse Gas emissions than road transport. Unfortunately, there may be industry resistance to these preference shifts if the same companies are involved both in road and sea transport.

Implications of Oceans Policy

Australia's Oceans Policy has significant implications for the maritime community. Goals of the policy include the promotion of ecologically sustainable development and job creation and the promotion of public awareness and understanding. It could be said that the policy represents the beginning of a new era of maritime awareness for Australia although realisation of this goal will depend on the ongoing commitment of the Federal Government to community awareness activities. The policy also provides guidance for the development of Australia's marine industries and the resolution of disputes over different uses and interests in the oceans. With regard to the oceans generally, the policy notes that:



Oceans define Australia's geography and are critical to our security, with our dependence on maritime trade and the maintenance of freedom of movement for all commercial shipping. Oceans link us with our trading partners, provide resources and wealth and offer a defence against possible aggression.

(Australia's Oceans Policy, Vol.2, p.37)

The policy notes that the challenge with the shipping industry is:

to increase Australia's trade and regional development by delivering safe, efficient, competitive and environmentally responsible maritime infrastructure and shipping services.

(Australia's Oceans Policy, Vol.2, p.16)

In a fairly balanced way, the oceans policy acknowledges the potential environmental impacts of the shipping industry and the importance of appropriate environmental controls and marine safety. In the early stages of policy development, there was some concern that because this process was the responsibility of the Federal Environment ministry, the resultant policy would be excessively "green". I do not think that this was the outcome. As far as far as I know, the two peak industry groups represented on the Ministerial Advisory Group on Oceans Policy (MAGOP) established by Senator Hill to provide input to the policy from stakeholder and other interest groups (the Australian Shipowners' Association and the Association of Australian Ports and Marine Authorities) were both fairly happy with the outcome.

Although the policy pre-dates the problems that emerged this year with the high level of "boat people" incursions and the revelation of apparent deficiencies in the arrangements for civil coastal surveillance, *Australia's Oceans Policy* expresses concern about trends with illegal movement into and out of Australia and the need for an effective surveillance and enforcement capacity. It indicates an intention to increase surveillance and enforcement measures in the Great Barrier Reef in particular and that the Government:

will continue to cooperate to review and rationalise effort involved in and capacity for surveillance and enforcement, including reviewing legislation relating to enforcement in Australia's marine jurisdictions".

(Australia's Oceans Policy, Vol.2, p.41)

Australia's Oceans Policy also poses consideration of Australia's capacity to manage our maritime interests, whether we have sufficient skills and expertise and whether we will be able to maintain these in the future. It acknowledges that the people involved in managing our oceans and maritime interests come from a diverse

range of backgrounds and disciplines. On maritime education generally, the policy notes that:

The Government will continue to:

- *encourage the provision of quality maritime education and research; and*
- *promote use by our neighbours of Australia's maritime educational services, particularly in support of IMO objectives, on a user pays basis.*

(Australia's Oceans Policy, Vol.2, p.18)

Clearly we need marine scientists and maritime lawyers to manage Australia's ocean domain, as well as economists and social scientists with experience and knowledge of the maritime environment, but the requirement that is sometimes overlooked is the one for people with experience of actually working at sea. A study conducted in 1996 of this requirement in the economy of the United Kingdom found that a serious shortfall was emerging in the supply of people with seafaring experience.² The demand for people with this experience exists in a great number of land-based maritime related sectors, including ship management, marine surveying, classification societies, port management, piloting, salvage, ship broking, marine pollution control, and education and training. The UK study found that while merchant navy service still appears to provide the most cost-effective training for these shore-based jobs, neither third party training nor the employment of foreign seafarers was likely to provide a ready remedy to offset the shortage of national officers. With the decline in the number of Australian-flag vessels, a similar situation probably exists in Australia and should be recognised in the programmes of marine skills and development and training to be implemented within the framework of national oceans policy.

Australia's Oceans Policy is also significant because it proposes a leadership role for Australia in helping to ensure that international ocean management regimes are effectively implemented in the three great oceans around Australia – the Indian, Pacific and Southern Oceans. The policy states that:

Australia should provide leadership regionally and internationally in the management of our oceans, recognising the possibility that national activities may have effects on the marine jurisdictions of neighbouring countries.

(Australia's Oceans Policy, Vol.1, p.40)

And that:

Oceans affairs are rightly a central part of our broader political and strategic relations in the regions in which our neighbours have extensive maritime interests, including exclusive economic

zones. They also have an urgent need to build their capacity to manage these areas.

(Australia's Oceans Policy, Vol.2, p.39)

Regional Ocean Interests

I would now like to turn to some of the international considerations with national oceans policy. These are important because, due to the interconnected nature of the world's oceans, no one country can have a truly independent national oceans policy. Nations must consider, for example, the impact of their oceans policy on their neighbours and on the ships of other nations that legitimately use their waters.

The Report last year by the Independent World Commission on the Oceans, entitled *The Ocean – Our Future*, emphasised the importance of the oceans to the future of the world. However, the oceans are also the setting of major problems. Territorial disputes that threaten peace and security, global climate change, illegal fishing, habitat destruction, species extinction, pollution, drug smuggling, congested shipping lanes, sub-standard ships, illegal migration, piracy and the disruption of coastal communities are among the problems that confront the international community. The issues involved are particularly important for Australia as we have one of the largest marine jurisdictions in the world and Australia is at the heart of the region of the world, Asia Pacific, where maritime problems are particularly acute.

Despite the rich potential of marine resources in the Asia Pacific, the development of these resources, particularly in East Asian waters, is troubled by major jurisdictional problems, and "beggar thy neighbour" attitudes which have led to over-fishing, and the marked degradation of natural habitats of coral reefs, mangroves and seagrass beds. Marine pollution originating from the land is a serious and largely uncontrolled problem in the region. The preservation and protection of the marine environment, the conservation of species, and the exploitation of marine resources is seriously complicated by conflicting and overlapping claims to marine jurisdiction and the lack of agreed maritime boundaries. These problems will only be overcome by a changed mindset based on a greater preparedness to cooperate in the management of regional oceans and seas.

Major maritime issues in Asia Pacific include shipping, fishing, marine safety, marine environmental protection and the exploitation of offshore hydrocarbons. Shipping is essential in the region for both inter-regional and intra-regional trade. Most Asia Pacific countries have a high dependence on fish and related marine products as a source of protein. More than half of the world's fish are caught and bred in Asian waters and slightly more than half are consumed in the region³. East Asian countries, in

particular, are increasingly looking towards oil and gas reserves beneath the sea for future economic prosperity, and to ease the problem of a growing energy shortage. However, the driving force for regional maritime cooperation and the key interest of all regional countries should be the fundamental obligation of all states to protect and preserve the marine environment.

The complexity of the marine environment in the Asia Pacific results both from enduring features of strategic geography and from dynamic aspects of the contemporary regional scene. Enduring geo-strategic features of the region include enclosed and semi-enclosed seas (such as the Yellow Sea, Gulf of Thailand and Arafura Sea), numerous archipelagos and islands, the number of international straits and confined shipping channels, complex oceanography, and a relative abundance of marine resources, although these are under considerable pressure of unsustainable development.

Dynamic aspects, particularly in the Western Pacific, include continued growth of regional naval forces and seaborne trade (despite the economic downturn of recent years); greater exploitation of marine resources; progressive development of regional maritime regimes (such as joint development zones, cooperative marine environmental protection measures, and procedures for archipelagic sealanes passage); and increasing stresses on the marine environment through higher levels of land-based marine pollution, degradation of marine habitats and over-fishing. In both the South Pacific and the Indian Ocean, the small island countries are faced with major problems in developing their capacity to manage very large EEZs (for example, Kiribati has an EEZ of 3.5 mill.sq.km and the Marshall Islands one of 2.1 mill.sq.km with ratios of land to sea area of 1:5,175 and 1:11,700 respectively).

These dynamic aspects of the marine environment suggest the difficulty of managing regional seas and oceans effectively and the need to strengthen maritime cooperation in the region. Without this strengthening, there are strong possibilities of both maritime competition and tensions over maritime issues intensifying in the Asia Pacific. An almost insoluble situation exists with the resolution of maritime boundaries in East Asian waters and there is still a long way to go with the delimitation of maritime boundaries in the South Pacific. The drive for sovereign rights over offshore resources and conflicting claims to offshore territory and maritime space all constitute a serious threat to regional stability and inhibit the processes of ocean management, cooperation and regime building.

These problems will only be overcome by the greater preparedness of regional countries to cooperate, yet significant barriers to maritime cooperation exist and



they may be becoming even harder to overcome. Any failure to cooperate on the solution of maritime problems, particularly with marine environmental protection, sustainable development and the conservation of marine biodiversity, will lead to a "tragedy of the commons" as a result of each country pursuing its own self-interests. If all countries act solely in their own self-interest in the maritime domain, all will eventually lose.

The crisis in East Timor is likely to lead to a major re-thinking of our defence and foreign policies. It has been what the editorial in *The Sydney Morning Herald* on 17 September 1999 called "a wake-up call to Australian politicians, defence planners and the public in general". As our political leaders seek to reshape the role that Australia might play in the region, it is to be hoped that they will be conscious of the role that Australia might play in the management of regional oceans, including activities that might reduce the risk of conflict at sea. The Report mentioned earlier by the Independent World Commission on the Oceans, *The Ocean Our Future*, has a lot to say, for example, about the role of navies in promoting peace and security in the oceans.

Australia has the skills and expertise to play a leading role in oceans management and dispute resolution in the South Pacific, the Indian Ocean region, South East Asia, and in the Southern Ocean, but to date the maritime environment has not been an area of high priority for Australia's foreign policy and international aid program. By comparison, the Canadian International Development Agency (CIDA) assigns a high priority in its programs to assistance in marine and coastal fields. As a consequence, Canada and Canadians have a high profile in these fields in both the South Pacific and South East Asia, and Australia is probably not deriving the full political benefit for the work it actually is doing in maritime fields, such as resource assessment, marine scientific research and coastal zone management. *Australia's Oceans Policy* gives some grounds for believing that this situation may change, noting that the Commonwealth Government will:

continue to develop measures, financed through the Australian Agency for International Development (AusAID) as appropriate, to help other countries in our region to build their technical, scientific and policy skills, management capacity and infrastructure so that they can move towards ecologically sustainable resource management, safe use of the oceans and environmental protection.

(*Australia's Oceans Policy*, Vol. 2, p.40)

Concluding Comments

The most common map of the world is the Mercator Projection centred on the Greenwich meridian. The

large land masses of Europe, Asia, Africa and the two Americas are the main eye-catching features of this map. Australia is tucked away in the bottom right hand corner with the largest of the world's oceans, the Pacific Ocean, split in two. The Western Pacific barely appears on the right-hand side of the map with a little more of the Eastern Pacific on the left-hand side. This map is the *continental* view of the world.

An alternative map of the world is one centred on the meridian of longitude of 180 degrees. This gives a very different perspective of the world. The eye is caught by the immensity of blue that dominates the land masses. The Pacific and Indian Oceans are now the most prominent features of the world. Such a map provides an *oceanic* or *maritime* view of the world giving a true impression of the 70% of the earth's surface covered by water. This oceanic or maritime view of the world is the one that Australians should have. It is a powerful visual image both of the importance of the oceans to Australia and of the emerging need for Australia to play a leading role in the management of oceanic affairs in the adjacent oceans. While the map puts Australia near the centre of the world, it also places Australia at the heart of a great oceanic domain formed by the Pacific, Indian and Southern Oceans.

At long last, Australia is starting to get its maritime act together and to appreciate where we stand in regional and global oceans affairs. The words of Psalm 107 are familiar to all seafarers, "They that go down to the sea in ships that do business in great waters". Australia has considerable business to do in great waters but we have been remarkably slow in getting down to the sea and to grips with the oceanic domain. Captain Boulton was a great champion of the maritime cause in Australia and I feel sure that he would welcome recent initiatives in Australia to put maritime issues firmly on the national agenda.

From being behind in the general area of oceans policy and management, Australia now has some justification in claiming world leadership in the promulgation of a coherent and consistent strategic planning and management framework for dealing with ocean interests. Australia is well placed with the appropriate skills and expertise to play a more active role in regional oceans governance and resolving the maritime problems that exist in the Asia Pacific region at present. With *Australia's Oceans Policy* we have the framework and the plan, it is essential now that we are also able to follow through and implement the plan.

NOTES

1. Frances McGuire, *The Royal Australian Navy - its Origin, Development and Organization*, Melbourne, Oxford University Press, 1948, p.5.
2. B.M. Gardner and Dr S.J. Pettit, *A study of the UK economy's requirements for people with experience of working at sea*, Commissioned by the Department of Transport, the Chamber of Shipping and the Marine Society, Cardiff University of Wales, May 1966.

3. "Fishing for Trouble", *Far Eastern Economic Review*, 13 March 1997, p.50.

* Sam Bateman is now an Associate Professor and Principal Research Fellow with the Centre for Maritime Policy, University of Wollongong, NSW 2522.

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Legal Aspects of Contemporary Naval Mine Warfare

By D.G. Stephens and M.D. Fitzpatrick*

Naval Mine Warfare is an area of military expertise that has truly come into its own this century.¹ Military planners herald the naval mine as an extremely effective, yet unglamorous option in the national weapons arsenal. A silent, passive and pernicious weapon, the naval mine, with its multiplier effect, is a weapon that has already influenced the strategic outcomes of conflict this century.² Significantly, the recent international efforts to ban landmines have not included naval mines. Accordingly, it is timely to consider the rules regulating the deployment of naval mines because these weapons remain a very important aspect of the catalogue of weapons available to most nations.

Given the recognised significance of the use of the naval mine, it is somewhat curious that the only specific treaty which has attempted to regulate this area of warfare, is the *Convention (VIII) of 1907 Relative to the Laying of Automatic Submarine Mines* (Hague Convention).³ The Hague Convention is regarded by some as comprising a poor compromise, and has been variously described as an "emasculated" and "worthless"⁴ treaty that was the product of diametrically opposed views of the participants to the Second Hague Peace Conference.⁵ The history of the negotiations leading to the treaty reflected the acknowledged value of the weapon itself. After the turn of the century, the naval mine was recognized as a relatively cheap weapon that directly threatened the naval superiority of established powers. This truism continues to apply today, and was particularly evident during the recent naval operations in the Persian Gulf.⁶

Notwithstanding the criticism surrounding the Hague Convention, its substantive provisions continue to impact upon the planning of naval operations. The first part of this article briefly outlines the military background leading to the Hague Convention's drafting, and analyzes the Convention's substantive provisions. These provisions, while greatly influenced by the political compromises of the Second Hague Peace Conference, disclose certain universal

principles that continue to apply to regulation of this area of naval warfare to this day.

The second part of this article focuses specifically on the current state of customary international law regulating naval mine warfare. The analysis relies heavily on the recent conclusions reached by a panel of international scholars, as reproduced in the *San Remo Manual*.⁷ This article contends that, in addition to the laws deriving from the Hague Convention, the emergence of general principles of the *jus in bello*,⁸ as manifested in the 1949 Geneva Conventions and the 1977 Additional Protocols, also significantly effects the manner in which contemporary naval mine warfare is undertaken.

This Article generally concludes that, far from being a worthless failure, the Hague Convention provides a substantial and lingering influence on the laws regulating naval mine warfare.

The Development of Naval Mine Warfare and the Substantive Terms of the 1907 Hague Convention

A. Background to the Hague Convention.

During the American Civil War (1860-1865), the use of naval mines demonstrated the weapon's early effectiveness in addressing the naval superiority of an adversary in armed conflict. Termed "torpedoes" at the time, Confederate forces inflicted greater damage upon Union naval forces with the use of these weapons than with gunfire. Indeed, in what is now general parlance, the American Civil War was the occasion for Admiral Farragut's famous and frequently quoted line, "Damn the torpedoes, Captain Drayton, go ahead."⁹

It was in the course of the Russo-Japanese War (1904-1905) however, that the unrestricted use of naval mines reached its apogee. Through that conflict, both forces laid thousands of mines, principally around the Eastern

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Russian ports of Vladivostok and Port Arthur.¹¹ In all, the use of naval mines was extremely effective as a direct weapon of warfare accounting for "2 battleships, 4 cruisers, 3 destroyers and a minelayer from the Japanese Fleet and one battleship, one cruiser, 2 destroyers and 2 gunboats from the Russian Fleet."¹² More significantly, the strategic value of mine-laying was realised during this conflict particularly in the opportunity to deny sea lanes from the adversary. The very unrestricted use of naval mines in this conflict was the impetus for developing some form of regulation. For a prolonged period following that conflict, the "coasts of Japan, China and Russia were polluted by mines that had broken adrift or had been laid and not swept."¹³ This 'pollution' caused considerable danger to commercial maritime activity and resulted in the tragic loss of lives. The following statement by the Chinese Government accurately summarised the alarming need to regulate naval mine warfare at that time:

*"The Chinese Government is even today under the necessity of equipping the vessels in its coastwise trade with special instruments to pick up and destroy the floating mines which encumber not only the high sea but also its territorial waters. In spite of every precaution being taken, a very considerable number of coasting trade boats, fishing boats, junks and sampans have sunk as a consequence of collisions with these automatic submarine contact mines, and these vessels have been utterly lost with their cargoes without the details of the disasters reaching the western world. It is calculated that from five to six hundred of our countrymen in pursuit of their peaceful occupations have met a cruel death through these dangerous engines."*¹⁴

These problems, which led to the drafting of the Hague Convention, disclose the irreconcilable differences¹⁵ between the dominant naval powers attending the conference, such as Great Britain, and emerging naval powers also attending, such as Germany. Notwithstanding the obvious humanitarian impulse to protect the safety of vessels from third-party States, Germany was not inclined to squander, through legal regulation, the naval mine's tactical and strategic usefulness. This is not to suggest that Britain's motivation to regulate the use of mines was altogether altruistic. Britain recognized that naval mines more than adequately redressed superior naval dominance and acted as a force-leveler. In its zealous efforts to "outlaw" naval mines, Britain was undoubtedly motivated by a desire to retain naval dominance. Indeed, as author Daniel Patrick O'Connell noted, "the Convention embodies a compromise between the British policy in 1907 of opposing the use of unanchored mines and minefields laid for the purpose of economic blockade and the German policy of using mines for the purpose of hampering pursuit and instituting such a blockade."¹⁶

The collision of motivation between these two powers is reflected in the compromised language of the Hague Convention that was ultimately adopted. It is ironic, therefore, that the humanitarian motivations reflected in the statements like that of the Chinese Government, have become, from a legal perspective, the Hague Convention's dominant and lingering legacy.

B. The Substantive Provisions of the Hague Convention.

While constituting some thirteen Articles, only Articles 1 through 5 of the Convention encompass the substantive provisions concerning the regulation of naval mine warfare.

Article 1 of the Hague Convention states that it is forbidden:

- (a) to lay unanchored automatic contact mines, except when they are so constructed as to become harmless one hour at most after the person who laid them ceases to control them; (b) to lay anchored automatic contact mines which do not become harmless as soon as they have broken loose from their moorings; [or] (c) to use torpedoes which do not become harmless when they have missed their mark.¹⁷

The subject matter of Article 1 is the "automatic contact mine." It was, at the time, one of only two types of naval mine in operation. The other, "Colt's mine," was activated by an electric cable, and thus was susceptible to manual control. The "automatic contact mine," however, was activated by the physical contact of the mine on the intended target. The emphasis in Article 1 is to ameliorate the deadly and non-discriminatory effects of "automatic contact mines" once they have escaped "control." The Article reflects the currently understood principle of distinction, stating that a distinction must be drawn between legitimate military objectives and civilian objects and the civilian population when conducting military/naval operations, and permitting only military objectives to be the subject of attack. While this principle is now expressly contained within Article 48 of Additional Protocol I to the 1949 Geneva Conventions,¹⁸ it was something of a novelty at the time of the Second Hague Peace Conference. The purpose of Article 1 in its protection of neutral shipping, was premised on a conception of mutual interest. The destruction of innocent neutral shipping afforded no military advantage to belligerents.

The application of Article 1 to modern warfare remains slightly contentious. Technology has far surpassed the two variants of naval mine available at the time of the Convention's drafting. A large variety of "influence" mines now exist that are not activated by direct contact, but may be activated by a number of other factors, including pressure, acoustics, magnetic and other such influence triggers.¹⁹ A description of the types of naval mines now available is limited only by the imagination of the designers as to the types of triggering



mechanisms that might be employed.²⁰ Hence, current types of naval mines include: aerial bombs, which have had their triggering mechanisms replaced with mine sensors; buoyant rockets, which are tethered to sinkers; homing torpedoes, which are activated upon receipt of suitable target signatures; non-homing torpedoes, which are submarine-launched and rest on the sea floor; and missiles, which are released from underwater "cocoon" upon receipt of suitable target signals.²¹ As a consequence of these variants, a workable generic definition of a naval mine which has been suggested is any "underwater explosive device that waits to sink or damage targets or deter them from entering an area."²²

Given the broad definition of the term "naval mine," the issue remains as to whether the purview of Article 1 encompasses modern naval mines. If it does not, the Article is otiose. The better view²³ on this point provides that Article 1 does apply to current naval mine types. This reasoning identifies that the Second Hague Peace Conference was not concerned with a consideration of the discriminatory status of the automatic contact mine itself, but rather the indiscriminate way such mines could be used.²⁴ Moreover, such an interpretation is consistent with the general requirement that States refrain from acts that would defeat the object and purpose of a treaty.²⁵

Article 2 of the Hague Convention states that it is forbidden "to lay automatic contact mines off the coast and ports of the enemy, with the sole object of interrupting commercial shipping."²⁶

In the course of the debates leading to the adoption of Article 2, Britain initially proposed a more comprehensive provision that outlawed the use of naval mines to establish or enforce commercial blockades.²⁷ Such a proposal would ensure that Britain, with its naval dominance, would enjoy an advantage in satisfying the criterion of ensuring a blockade was "effective" as required under classic prescriptions, and thus maximizing the legal rights which subsequently accrued. Such a proposition was not accepted and the effectiveness of the Article, with its qualification of the "sole object" test, effectively rendered the operative provisions of the Article redundant. Indeed, this addition of the "sole object" test has been described as the "yawning loophole"²⁸ that does not require great ingenuity to circumvent.

Article 3 states that:

When anchored contact mines are employed, every possible precaution must be taken for the security of

peaceful shipping. The belligerents undertake to do their utmost to render these mines harmless within a limited time, and, should they cease to be under surveillance, to notify the danger zones as soon as military exigencies permit, by a notice addressed to ship owners, which must also be communicated to the governments through the diplomatic channel.²⁹

A significant aspect of Article 3 is its reference to "peaceful shipping."³⁰ The emphasis here accords with contemporary developments in the law of naval warfare, in that neutral vessels not engaged in belligerent activity are accorded immunity from attack or capture. Notwithstanding this, Article 3's apparent obligation to "render these mines harmless within a limited time"³¹ is problematic. If a "limited time" is not equated with the cessation of hostilities, then such a proposition is not consistent with subsequent State practice, particularly U.S. actions during the Vietnam conflict.³² The provision also misconceives the significant role that the minefields play in sea denial. A naval minefield has "completely succeeded in its mission if the opponent refuses to challenge it".³³ In this regard, the requirement to provide "notice" as mandated by the provision readily serves strategic purposes in its own right. Indeed, the emphasis on proper notification of naval minefields, which are otherwise under control, has become a pre-eminent legal obligation that has been recognized by the International Court of Justice³⁴ and is reflected in contemporary customary law.³⁵

Notwithstanding the recognition of early principles of notice within Article 3, the caveat that some of these obligations are dependent upon "military exigencies," necessarily undermines the efficacy of the provision. Such an emphasis is not permissible today under the contemporary law. The concept of "military necessity" is now only one element of the "proportionality" equation as mandated by Articles 51(5)(b) and 57 of



HMAS HAWKESBURY during shock trials off the NSW Coast.



the Additional Protocol 1 of the Geneva Conventions,³⁶ as well as constituting an independent principle of customary international law in its own right. As such, it is contended that the terms of Article 3 and the qualification upon the obligation concerning "military exigencies" is now completely spent.

Article 4 provides:

Neutral Powers which lay automatic contact mines off their coasts must observe the same rules and take the same precautions as are imposed on belligerents. The neutral Power must inform ship owners, by notice issued in advance, where automatic contact mines have been laid. This notice must be communicated at once to the Governments through the diplomatic channel.³⁷

Article 4, while ostensibly repeating the terms of Article 3, is significant in its recognition of neutral rights for sea denial. Such security rights today, however, may be generally enforced in accordance with Article 25 of the 1982 Law of the Sea Convention (LOSC),³⁸ which permits a coastal State to suspend even innocent passage in a non-discriminatory basis where such suspension is essential for the protection of its security.

Article 5 states:

At the close of the war, the contracting Powers undertake to do their utmost to remove the mines that they have laid, each Power removing its own mines. As regards [sic] anchored automatic contact mines laid by one of the belligerents off the coast of the other, their position must be notified to the other party by the Power which laid them, and each Power must proceed with the least possible delay to remove the mines in its own waters.³⁹

Notwithstanding the internal inconsistencies relating to the allocation of principal responsibility for the removal of mines,⁴⁰ the import of Article 5 is clear. The continuing danger of this passive weapon system is recognized, and ongoing obligations are directly imposed upon parties at the cessation of hostilities. It is also significant, however, in its implicit recognition of the extent of belligerent rights created. While a state-of-war allows for the legitimate deployment of mines, the ending of such a state-of-war imposes quite exacting obligations concerning the removal of naval mines. By implication therefore, "war" seems to be the authority for the deployment of mines. Current legal prescriptions would now allow for the use of naval mines notwithstanding the absence of a state-of-war. This has resulted, however, in the emergence of acute commensurate obligations concerning the control of such mines.

C. The Character of the Hague Convention.

As qualified and diffuse as it is, the Hague Convention remains a significant influence in the regulation of naval warfare. While necessarily a product of

significant compromise, the Convention was somewhat prophetic in its early recognition of the need to distinguish between combatants and non-combatants and its imposition of ongoing obligations upon belligerent parties to better protect peaceful shipping and secure freedom of navigation. More particularly, the Convention remains an early testament to the now universally accepted principle that the right of the parties to an armed conflict to choose methods or means of warfare is not unlimited.⁴¹ As is outlined in the following part of this article, many of the provisions within the Convention have now crystallized into customary international law. In this regard, the Convention transcends many of its turn of the century limitations and hence continues to influence the contours of law in this area.

The Application of the Hague Convention to Contemporary Conflict

The Hague Convention was negotiated in accordance with the prevailing law, which applied at the turn of the century to regulate the *jus ad bellum*.⁴² At that time the law made a sharp distinction between the "law of war" and the "law of peace." Accordingly, military actions that were not permissible due to a prevailing peace, could be rendered lawful by the manifestation of a declaration of war.⁴³ This was an extremely efficient, if not morally acceptable, appraisal of international relations. As a result of this background, the Hague Convention allows for the attraction of belligerent rights as a result of a state of "war." Indeed, the continued deployment of naval mines and failure to recover existing mines outside of this legal state of "war" would appear to be manifestly unlawful.

The emergence, however, of the increasing legal proscription of war, first through the League of Nations Covenant⁴⁴ and the Pact of Paris⁴⁵ and then through the United Nations Charter system,⁴⁶ calls into question the continued validity of rights and obligations owed under the Hague Convention.⁴⁷ One interpretation of this contemporary legal state is to determine that 'belligerent rights', as such, have fallen into desuetude. Thus, there is no continuing validity to the content of the Hague Convention. The other and more attractive view is to acknowledge that the content of the Hague Convention continues to apply according to its own tenor. However, it applies only to the extent that such content is consistent with the contemporary *jus ad bellum* (particularly in relation to the criteria of necessity and proportionality) and otherwise conforms to the current general principles relating to the *jus in bello*.⁴⁸ This view avoids a legal vacuum and must therefore be preferred. Indeed, as late as the 1970s, countries were still succeeding to the Hague Convention.⁴⁹ Such actions indicate a recognition that the Hague Convention continues to have *de jure* significance



Modern Rules of Customary Law

The challenge in planning contemporary naval operations is to translate the relevant provisions of the Hague Convention into workable and meaningful rules. In this regard, customary international law applies to "fill gaps" and provides a reliable basis for such planning. Until recently, it was difficult to properly discern the nature of applicable customary rules, especially because no authoritative statement or analysis had been undertaken on the customary law of naval warfare since prior to the First World War.⁵⁰ Recognising this conundrum, in June 1994, a group of legal scholars and naval "operators" completed a Manual on the Law of Naval Warfare.⁵¹ Known generally as the *San Remo Manual*, it contains some very incisive conclusions on the state of law relating to naval mine warfare and its commentary provides a useful guide in distilling relevant principles from disparate sources. Naturally enough, the *San Remo Manual's* provisions dealing with naval mine warfare draw heavily upon the Hague Convention and combine these rules with conclusions made on observed State practice and associated *opinio juris* and more general principles such as those found in the Geneva Convention Protocols. Given this authority, this part of this article reviews the rules considered by the authors of the *San Remo Manual* for customary international law applicable to contemporary naval mine warfare. Each rule will be stated and an analysis undertaken of its content.

*A. Mines May Only Be Used for Legitimate Military Purposes Including the Denial of Sea Areas to the Enemy.*⁵²

This first rule highlights the principle of distinction as understood under contemporary prescriptions. The use of the phrase "military purposes" paraphrases Article 48 of the 1977 Additional Geneva Protocol in its general reference to those "objectives" which may be made the subject of attack. Within contemporary naval mine warfare this encompasses a considerable number of vessels. Vessels which are considered to be legitimate objectives comprise, *inter alia*, enemy warships and their auxiliaries, enemy merchant ships that engage in belligerent acts or otherwise make an effective contribution to military action, and even neutral merchant ships engaging in activities in support of enemy military action.

Additionally, the rule also anticipates no geographic limitation on the sowing of mines.⁵³ Indeed, the commentary to the rule identifies military planning doctrine, which allows for a defensive minefield (used to deny access to the territory of a belligerent), a protective minefield (used to protect shipping routes, denying enemy submarines or surface craft the use of certain waterways outside coastal waters – i.e., international waters of a belligerent), or an offensive minefield (mining of waters under control of the enemy).⁵⁵

An express right to sow mines within international waters is a "progressive" step in the interpretation of the law. Notwithstanding this, a number of subsequent rules in the San Remo Manual – substantially qualify this general proposition by referring to obligations to respect third party navigational rights. In fact, these subsequent rules provide greater positive obligations upon mine-laying States to protect "peaceful shipping" beyond providing simple notification and severely circumscribe the apparent right to lay mines within international waters.

Finally, it is contended that the express recognition of the "sea denial" role of naval mines within this rule supersedes the provision in Article 3 of the Hague Convention, which would require mines to be rendered "harmless" within a limited time. Such a legal obligation as contained within the Hague Convention would severely undermine the significant strategic role that mine fields play in contemporary naval warfare and its "repeal" within this customary rules is necessarily reflective of strategic realities.

*B. Parties to a Conflict Shall Not Lay Mines Unless Effective Neutralization Occurs When They Have Become Detached or Control Over Them is Otherwise Lost.*⁵⁶

This rule closely resembles the terms of Article 1 of the Hague Convention, and again, is directed towards ensuring respect for the principle of distinction. The commentary highlights the expansive reach of the substantive obligations under customary law concerning the monitoring of mines in circumstances where control over such mines is otherwise lost.⁵⁷

*C. It is Forbidden to Use Free-Floating Mines Unless They are Directed Against a Military Objective and they Become Harmless Within an Hour After Loss of Control Over Them.*⁵⁸

This rule is in many respects a reiteration of the principle of distinction emphasized in the two customary rules previously stated. Interestingly, the commentary states that free-floating mines may have a degree of military utility.⁵⁹ The rule anticipates that such mines might be deployed as a matter of tactical necessity in circumstances where such mines could be



dropped to foil an immediate pursuit by opposing hostile forces.⁶¹

It appears there is a fundamental inconsistency with this proposition. A free-floating mine represents one of the more self-evident violations of the principle of distinction. The commentary, in its acceptance of the "military necessity" of such an act, must necessarily conclude that any "collateral" damage, occurring even on protected vessels, is acceptable.⁶¹ Such reasoning is not supportable. While it is an undoubted right for naval/military forces to defend themselves under the aegis of unit self-defense,⁶² such actions do not justify violating the most fundamental principles of the *jus in bello*. Indeed, such proscription is so entrenched that even the caveat within the rule of "one hour" cannot surely be cited in support of any apparent modification of the rule. Could it be any less of a violation of the *jus in bello* that a passing hospital ship was struck by a floating mine deployed by pursued forces within the hour of "grace" than outside this time?

*D. The Laying of Armed Mines or the Arming of Pre-laid Mines Must be Notified Unless the Mines Can Only Detonate Against Vessels that are Military Objectives.*⁶³

The provision for giving notice finds its first expression in this rule. Assuming that such notice procedures are met, the question of correlative third party rights does arise. What obligations are imposed upon third parties for subsequently entering such a minefield? Can such notification principles, faithfully complied with by the belligerents, undermine third party freedom of maritime navigation rights? There seems to be occasions when such maritime rights may be supplanted by the right of national self-defense.⁶⁴ Accordingly, the mine-laying State in providing notice will not be in breach of international obligations if a third party State decides to enter its forces within such a minefield, provided that such a minefield is otherwise lawfully created.

*E. Belligerents Shall Record the Locations Where They Have Laid Mines.*⁶⁵

This rule is a necessary consequence of the already stated rule to notify the international community of the laying of armed mines. It is also an incident of the rule to maintain control over mines. There is no limitation on the type of mines that must be recorded or whether they are armed or not. According to the commentary however, the rule does not require that such records be made public unless there is some danger for neutral shipping.⁶⁶

*F. Mining Operations in the Internal Waters, Territorial Sea or Archipelagic Waters of a Belligerent State Should Provide, When Mining is First Executed, for Free Exit of Shipping of Neutral States.*⁶⁷

This rule derives not from the Hague Convention, but is an implication of the general principle of

distinction. Moreover, the commentary states that it is reflective of international practice as evidenced by the American actions during the mining of Haiphong Harbor during the Vietnam conflict.⁶⁸

The rule is interesting because of its reference to territorial seas or archipelagic waters. Presuming that "mining operations" are justified as an act of national self-defence, then the rule would seem to allow for the disruption of innocent passage through territorial or archipelagic waters. This remains a contentious issue and raises the question as to the extent to which belligerent operations allow for the amelioration of long standing third party navigational rights. It would seem from the international experience relating to the mining of various Vietnamese ports during the Vietnam War that such proscription is acceptable.⁶⁹

*G. Mining of Neutral Waters by a Belligerent is Prohibited.*⁷⁰

Article 2 of the United Nations Charter prohibits the use or threat of force in the conduct of international relations.⁷¹ This principle is regarded as having a status of *jus cogens*.⁷² Interestingly, neutral waters are defined within the commentary as comprising only a State's internal waters, territorial sea or its archipelagic waters.⁷³ The definition does not include archipelagic sea lanes or international straits that are regarded as having a legal character that is *sui generis* and thus outside the prohibition contained in this rule.

Beyond the prohibition contained within Article 2 of the United Nations Charter, it is also arguable that laying mines within a neutral's waters also constitutes an "armed attack" for the purposes of Article 51 of the UN Charter. Additionally, such actions may constitute a "blockade" (depending on the circumstances) under Article 3(c) of the 1974 General Assembly Resolution on the Definition of Aggression⁷⁴ and are therefore deemed acts of aggression. Such a conclusion would therefore provide a basis for Security Council actions pursuant to Chapter VII of the UN Charter.⁷⁵

*H. Mining Shall Not Have the Practical Effect of Preventing Passage Between Neutral Waters and International Waters.*⁷⁶

While this rule is a necessary consequence of the aforementioned rule, it is significant in its reference to international waters. It reflects the law's continuing ambiguity surrounding the legitimacy of mining international waters. Again, this rule does not provide for a general prohibition, but nevertheless seeks to regulate such actions in order to ensure freedom of navigation rights.

*I. The Mine-laying States Shall Pay Due Regard to the Legitimate Uses of the High Seas By Providing Safe Alternative Routes for Shipping by Neutral States.*⁷⁷

This rule specifically directs the maintenance of traditional high seas' freedoms and provides yet

another qualification on the right to lay mines within international waters. It is significant in its failure to require safe alternative routes of "similar convenience" which is the terminology used generally in the LOSC.⁷⁸ This would suggest that such "safe alternative routes" need not take account of commercial or even navigational priorities. Interestingly, the commentary emphasizes that the obligation is with respect to safe transit.⁷⁹ Thus, the provision of alternative routes is not the only method of complying with this rule. Escorting neutral vessels through a minefield rather than providing other alternative routes would be another method of complying with this rule. Such a decision would, however, undoubtedly be subject to the tactical and geographical realities that impact the military utility of undertaking such an action.

*J. Transit Passage Through International Straits and Passage Through Waters Subject to the Right of Archipelagic Sea Lanes Passage Shall Not be Impeded Unless Safe and Convenient Alternative Routes are Provided.*⁸⁰

This rule reflects the current legal status of such international straits and archipelagic sea lanes as contained within the LOSC.⁸¹ Rights of transit passage and archipelagic sea lane passage to third parties cannot be suspended under any circumstances. It is interesting, however, that while the commentary to the rule recognises the new legal status of these waterways, it concludes that it is not unlawful *per se* to lay mines within these areas.⁸² Such actions would, however, impose extremely high ongoing obligations to ensure safe and convenient alternative routes.

*K. Neutral States Do Not Act Inconsistent with the Laws of Neutrality by Clearing Mines Laid in Violation of International Law.*⁸³

This rule is significant because it recognizes the correlative "self-help" rights to ensure that the *jus in bello* retains its integrity. Significantly, the commentary makes the point that this rule is declaratory of customary international law.⁸⁴

L. Remaining Rules.

The remaining rules⁸⁵ relate to obligations to remove, or render harmless naval mines and the sharing of technical information relevant to the removal of such mines following cessation of hostilities. These provisions reflect the terms of Article 5 of the Hague Convention concerning the removal of mines following the conclusion of a war.⁸⁶ The rules, however, are concerned only with the removal of mines when practically possible and, in that respect, adopt terminology that reflects the Geneva Conventions' concern; the concern is not with the legal status of any conflict, but rather the practical reality of ending hostilities.⁸⁷

Conclusion

As a matter of historical fact, the Hague Convention remains the principal treaty regulating the law of

naval warfare today.⁸⁸ It was drafted in an era where belligerent rights were allowed considerable priority within the legal landscape and in this regard it was very much an expression of political realism. Nonetheless, the humanitarian impulse, which featured in the negotiations and have themselves become preeminent in the modern determination of rights and obligations in this area.

The law relating to naval mine warfare, as manifested in the terms of the Hague Convention and subsequently developed customary international law, is a body of law that possesses a particular efficacy. As outlined in the *San Remo Manual*, this area of regulation is mostly concerned with the balancing of rights. Such balancing relates to the theoretical interaction of the *jus ad bellum* and *jus in bello*, through to more specific issues concerning freedom of navigation and self-defensive actions.

While it has been a theme of this article that the law of naval mine warfare is a dynamic area, there is also a genuine acceptance by States and military planners of the cogency of the rules so far developed. There is no doubt that the *San Remo Manual* has facilitated consideration of the underlying principles that comprise the law of naval mine warfare. Indeed, perhaps the most compelling endorsement lies in the faithful incorporation of its terms within many military manuals, and in the ready acceptance of such principles as representing "common sense" by military planners within the operational environment.⁸⁹ An ambitious, though now realised aim of the drafters of the *San Remo Manual* themselves.

NOTES

1. See Thomas A. Clingan, Jr., *Submarine Mines in International Law*, in *THE LAW OF NAVAL OPERATIONS* 351 (Int'l Law Studies, vol. 64, Horace B. Robertson, Jr. ed. 1991).
2. See generally, Ernest Fortin, *Those Damn Mines*, U.S. NAVAL INST. PROC., July 1992, at 30.
3. Convention (VIII) Relative to the Laying of automatic Submarine Contact Mines, Oct. 18, 1907, 36 U.S.T.S. 541 [hereinafter Hague Convention VIII].
4. HOWARD S. LEVIE, *MINE WARFARE AT SEA* 53 (1992).
5. See DOCUMENTS ON THE LAWS OF WAR 3 (Adam Roberts & Richard Guerlff eds., 2nd ed. 1989).
6. See generally J.M. Martin, *We still Haven't Learned*, U.S. NAVAL INST. PROC., July 1991, at 64.
7. INTERNATIONAL INSTITUTE OF HUMANITARIAN LAW, *SAN REMO MANUAL ON INTERNATIONAL LAW APPLICABLE TO ARMED CONFLICTS AT SEA* (Louise Doswald-Beck ed., 1995) [hereinafter *SAN REMO MANUAL*].
8. The term "*jus in bello*", also termed "*jus belli*", means: "The law of war [or armed conflict]. The law of nations as applied to a state of war [or armed conflict], defining in particular the rights and duties of the belligerent powers themselves, and of neutral nations. That which may be done without injustice with regard to an enemy". BLACK'S LAW DICTIONARY 771 (5th ed. 1979). The term is distinguishable from the term, "*jus ad bellum*", also termed "*jus bellum dicendi*", which means: "the right of proclaiming war [or armed conflict]." *Id.*
9. Confederate mines sank twenty-seven Union ships; in comparison Confederate gunfire accounted for only nine ships. See LEVIE, *supra* note 4, at 13.
10. Fortin, *supra* note 2, at 30.
11. See generally, Clingan, *supra* note 1, at 351.
12. R.H. Crane, *Mine Warfare - History and Development*, 10 J. AUSTL. NAVAL INST. 31, 37 (1984).



13. *Id.*
14. LEVIE, *supra* note 4, at 29.
15. *Id.* at 25.
16. 2 DANIEL PATRICK O'CONNELL, INTERNATIONAL LAW OF THE SEA 1138 (IVAN ANTHONY SHEARER ED. 1984).
17. Hague Convention VIII, art. 1.
18. Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), June 8, 1977, art. 48, 1125 U.N.T.S. 3 [hereinafter Geneva Protocol I].
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32. See generally, SAN REMO MANUAL, *supra* note 7, at 172 n.138.
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34. See Military and Paramilitary Activities (Nicar. V U.S.) June 27, 1986, 25 I.L.M. 1023, esp. Schwebel decision on this point at 1146 para. 238.
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37. Hague Convention VIII, art. 4.
38. U.N. Convention on the Law of the Sea, U.N. Doc. A/Conf.62/122 (1982) [hereinafter Law of the Sea Convention].
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52. *Id.* at 169.
53. See Geneva Protocol I, art. 48, 1125 U.N.T.S. 3.
54. Geneva Protocol I, art. 49, para.2, 1125 U.N.T.S. 3.
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57. *Id.*
58. *Id.*
59. *Id.*
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71. U.N. CHARTER, art. 2, para.4.
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74. See G.A. Res. 3314, U.N. GAOR 29th Sess, Annex 7.5, art. 3(C) (the definition of "aggression" includes "the blockade of the ports or coasts of a State by the armed forces of another State...").
75. U.N. CHARTER, arts. 39-51.
76. SAN REMO MANUAL, *supra* note 7 at 173.
77. *Id.*
78. Law of the Sea Convention, art. 53, para. 4, art. 38, para. 1.
79. SAN REMO MANUAL, *supra* note 7 at 173.
80. *Id.* at 174.
81. Law of the Sea Convention art.'s 37 & 53.
82. SAN REMO MANUAL, *supra* note 7 at 174.
83. *Id.* at 176.
84. *Id.*
85. *Id.* at 174, 175.
86. Hague Convention VIII, art.5.
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In Brief – The MHI Experience

By Commander Mike Welford, RAN

During the mid to late 1980's, a small indigenous designed minehunter for the RAN was becoming a reality. Due to its size it was designated the Minehunter Inshore or MHI. It was a novel approach using a catamaran hull (which had proven itself as a stable platform for ammunition lighters in Sydney Harbour) made from foam reinforced with GRP similar to the Swedish Minehunter Landsort class. The contractor was Carrington's of Newcastle and the design was an internal Defence Naval initiative. The concept was originally to design the MHI with a limited size and weight to counter pressure mines and low acoustic and magnetic signature to avoid other mine influence types. Much of the equipment was to be containerised to allow ease of installation and removal so that when breakdowns occurred the faulty system could be removed and a new one put in place. This would allow the MHI to quickly return to its operations. The crew was to be kept to a minimum by carrying out repairs ashore and reducing the technical sailors carried. In effect the MHI was to be operated similarly to an aircraft, with two or more crews, which would allow it to remain at sea for longer periods of time. At one stage helicopters and or hovercraft were considered to exchange crews and resupply at sea. Sadly, the cost of the MHI escalated and the concept was not as successful for the RAN as hoped. Nonetheless the MHI had a role in inshore waters and it was marketed



throughout the Middle and Far East by a series of officers in the project. One of them, CMDR Mike Welford RAN, is seen above relaxing during a visit to the Pyramids during a marketing meeting to Egypt. In addition, he and others visited Oman, Qatar, Bahrain, Dubai, Abu Dhabi, Saudi Arabia, Pakistan, Singapore and the Philippines in an effort to sell the MHI design overseas.

The MHI sales plan met no success and so Australia was left with only its two MHIs.



HMAS RUSHCUTTER at sea.



A New Minesweep System – Proven and Efficient

By Hector J Donohue

Abstract

The end of the Cold War has seen a new emphasis on naval operations relatively close to the shore which in turn increases the potential threat from mines. The requirement for an influence sweeping capability to complement minehunting is well recognised by most nations involved in mine countermeasures. The evolution of mine sensors and logic has been such that traditional sweeps based on Mine Setting Mode (MSM) technology many decades old are fast becoming obsolete. Increasing research activity is being devoted to minesweeping, the trend being towards emulation sweeps in what is termed Target Emulation Mode (TEM). This paper will examine the requirement for new sweeping techniques and describe how the Australian Dyad Influence Sweep, together with a new, innovative acoustic generator, provides a practical solution to cope with both the older technology and the modern mine. Particular emphasis is given to the practical limits for the required accuracy of signatures.

Introduction

Any future military crisis will almost inevitably involve maritime operations, including the protection of sea lines of communication, the deployment of task forces, the transport of troops and heavy lift, and possibly, amphibious operations. These operations will involve forces being deployed in operations close to shore in what is often termed littoral warfare. It is within such scenarios that naval forces are most vulnerable. Apart from the potential for land based air attack, the shallow water littoral region is dominated by the threat posed by the quiet conventional submarine and the weapon that waits – the mine.

The Exclusive Economic Zone concept has also changed the nature of maritime strategy. Nations need to consider not only the defence of ports and coastlines, but the surveillance and control of fixed assets offshore, such as oil rigs, as well as the dynamic resources within their economic zones, such as fisheries. Another major factor relating to today's international environment is that operations, such as United Nations sponsored activities, have an emphasis on safety, as loss of life in such contingencies is generally unacceptable. Under these regimes the mine, being indiscriminate by nature, assumes an even more potent threat.

A New Minesweep

As most navies recognise, the most effective Mine Countermeasures (MCM) force structures include both minehunting and minesweeping, as these two techniques complement each other.

The overall effectiveness of the minehunter is directly influenced by its sonar capabilities, the environment, its ability to utilise historic seabed survey data and the skills of its personnel. Low target-strength mines, the buried mine, and mines laid in a high clutter background impact significantly on the effectiveness of minehunting techniques. In adverse minehunting environmental conditions minesweeping is an essential complement to minehunting and the preferred technique.

Minesweeping in support of minehunting can also improve the overall percentage clearance. Even in good minehunting conditions, the minehunter can only be expected to achieve a clearance of some 90%.

An analysis done by the Australian Defence Science and Technology Organisation (DSTO) has summarised the combined effectiveness of minehunting and minesweeping in the Australian environment, using Dyad Influence Sweeps. This is shown in figure 1, and clearly indicates the value of including the Dyad minesweeping system. This results in the overall probability of clearance achieved by the combined MCM forces, in all minehunting conditions, to that approaching 100%.

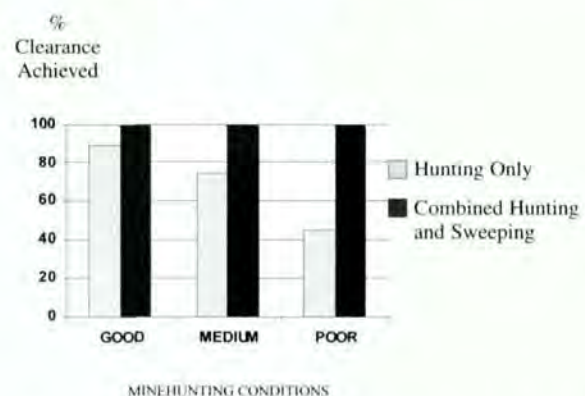


Figure 1. Impact of Dyad Influence Sweeps on MCM Operations

Further analysis by DSTO of the use of Dyad Influence Sweeps in a short term MCM operation is shown in figure 2. As can be seen, the intelligent,

modern mines set to a low ship count were all swept to around 99%, whilst the older technology mines with a higher ship count were swept to around 80%. The lower clearance for the older mines merely reflects the relatively high ship count and limited time available to sweep. If more time had been allocated, the clearance would have been in the order of 99%. The result shows how effective the Dyad Influence Sweep is against both older mines as well as the latest technology mines.

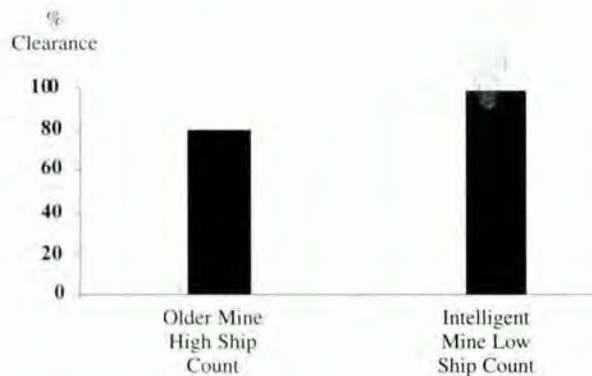


Figure 2. Short Term MCM Operation – Dyad Influence Sweep Results

New Sweeping Technology – The Need

Up to the 1980s, influence mine design was constrained by sensor limitations and comparatively rudimentary logic, with actuation taking place when the magnetic and acoustic signatures stimulation reached a certain magnitude or rate of change. Traditional sweeps such as the closed loop and electrode were developed to defeat this rather simple mine logic. These sweeps provided a strong, but not necessarily ship-like magnetic signature, and were effective since there was no requirement for the influence characteristics to have any actual resemblance to that of a target. Similarly, acoustic sweeps were designed to generate an acoustic output over the frequency band where the mine being swept had its maximum sensitivity.

Advances in sensor capability and the introduction of micro processor technology have significantly increased the flexibility of modern mine logic which can permit analysis of magnetic and acoustic signatures. Modern mine logic has the ability to assess the magnetic anomaly in three axes to ensure that it meets the spatial and temporal characteristics of the target. When this is combined with, say, the simultaneous detection of underwater sounds which are frequency analysed for structure, traditional sweeping techniques tend to be ineffective. Today's mine threat will include both "smart" and older type mines. Consequently a sweep is required which will

work as effectively against the modern as the older type mines. The solution to this is the emulation sweep.

Dyad Technology

The Dyad technology which has dramatically changed the effectiveness of influence minesweeping, is the result of considerable research conducted in Australia by DSTO. Using the revolution in industrial magnet technology, DSTO investigated the use of ferrite permanent magnets for a minesweeping application.

DSTO developed an elegant mathematical model of steel-ferrite magnets, in which the steel in three tubes acted as a magnetic amplifier for two ferrite magnet discs. The model provided the theoretical maximum value of magnet efficiency (magnetic moment per unit mass of magnet) which could be used as a design goal when designing practical magnets. The model also provided optimum design parameter values. These included tube wall thickness, separation distance of the ferrite discs and the mass of ferrite in each disc.

By the early 1980s, DSTO had expressed confidence to the Royal Australian Navy (RAN) that the technology had the potential to be developed into an operational minesweep. In designing and developing the Dyad, many features were considered, not the least being tow stability, minimising drag; buoyancy, to enable an acoustic generator to be suspended from the Dyad; and resistance to shock. Following extensive developmental trials, the system was accepted into RAN service in 1992.

The Dyad is an all welded body, strengthened by internal ribs which enhance the inherent structural integrity of the design. It is some 8 metres long, 0.5 metres diameter and weighs some 1.6 tonnes. The mass to buoyancy ratio of 10:1 provides near neutral buoyancy, minimising the effect of wave motion and ensuring a stable and effective magnetic signature from an array of Dyads in high sea states. Figure 3 shows a stack of four Dyads ready for loading onboard a ship.



Figure 3. Four Dyad Stack



A model developed by ADI can accurately predict the magnetic field resulting from any array of Dyads. Ranging of Dyad Influence Sweeps by DSTO has confirmed the accuracy of this model, which means that they can be easily configured to produce an emulation sweep.

Target Emulation Mode Sweeps

An emulation sweep is one designed to produce magnetic and acoustic signatures which closely resemble those of a particular class of ship, and so enable the sweep to be accepted as a valid target by modern mine logic set to fine ship catching tolerances. Utilising a sweep which emulates a ship signature can be termed sweeping in Target Emulation Mode (TEM).

The pre-requisite for designing an emulation sweep is the magnetic signature of the vessel or vessels to be emulated. These can be obtained through magnetic ranging and can be presented as magnetic models of the vessel, or in the form of a profile plot at specific depths and offsets. Magnetic profile plot data can also be obtained through the use of exercise mines. The most accurate results are achieved where the signatures of vessels are obtained within the area of operations, immediately prior to minesweeping operations commencing.

Based on the nature of ship influence signatures, it is possible to derive some simple guidelines for the design of emulation sweeps.

From a spatial perspective, the length and speed of the sweep must be similar to those of the emulated vessel class to satisfy magnetic gradient and temporal logic during the sweep/mine encounter. Acoustic sources must be distributed along the sweep to provide temporal fusion of magnetic and acoustic influences. Signatures must be stable and not modulated, for example, magnetic sweep must not be pulsed.

To provide structural emulation, the sweep magnetic signature should have a tri-axial vector component structure and the vector components should exhibit the field ratios, gradients and polarity changes appropriate to the emulated ship class. For example, the ratios between the vertical and horizontal field components for a particular sensor orientation should reflect the fluctuating ratios to be expected from a ship.

To emulate the intensity, the strength of the sweep magnetic field should be of similar magnitude to that of a ship. In order to achieve a widest possible swept width the intensity of the field should exceed that of the target ship class, but not by an excessive margin to ensure that emulation is not compromised. Mine logic aims to ensure that actuation by a ship is within damage range. Whilst the sweep has a larger magnetic field than the emulated target, mine logic and the attenuation of magnetic field abeam of the sweep are

such that its actuation width is not significantly larger than target damage width.

Physically the sweep must be manoeuvrable and able to withstand high levels of shock without disruption to operations. Shock resistance is an important factor in emulation sweep design since modern mine logic will be designed to detonate within the damage radius of a target and thus the sweep will be subjected to severe shock loadings.

Emulation sweeps, by definition, are deterministic, ie. the actuation probability during a sweep/mine encounter approaches 100%. If the sweep signature falls within the targeting criteria of the mine then it must actuate. If the signature is outside the mine's targeting criteria then the signature of the vessel class being emulated will also be unacceptable to the mine logic and that traffic can safely transit the mine danger area. The tactical implication of using an emulation sweep in TEM is that the sweep will not necessarily actuate all mines, but it will actuate those mines with sensitivity setting and logic which would have been actuated by the vessel classes being emulated.

It is important to remember that emulation sweep designs are effective against all mines types but the ability to manipulate an emulation sweep signature will also provide the capability to configure an optimum sweep in a Mine Setting Mode (MSM). That is, produce a resultant signature designed for optimal performance against a particular mine sensitivity and logic setting. Modern microprocessor controlled mines will have the operating software stored in volatile memory and will probably simultaneously apply a number of logics and sensitivity settings to the various magnetic field vector components. Thus MSM would only be used against a modern mine when the settings are known, eg. against a protective minefield laid by own forces. MSM remains a valid tactic for older mine types if the mine logic is available from intelligence or reasonably accurate analysis of the mine threat and intended targets.

The essential difference between the two sweep design modes is that the TEM sweep is designed to clear those mines which would represent a threat to the emulated vessel class, regardless of mine sensitivity, settings or logic. MSM on the other hand is designed to have improved performance against mines for which logic and sensitivities are known and the actuation range for the sweep is greater. However, as TEM is effective against all mine types, in the absence of intelligence, it is the preferred technique.

Modern Mine Constraints

The design of influence mines has always included, and still includes, a compromise between 'ship catching' capability and 'sweep rejection' capability. This compromise involves tolerances in mine logic for



the acceptance of magnetic and acoustic signatures required for actuation. If a tolerance is too narrow in an attempt to completely reject sweeps then targets will be missed. If a tolerance is too wide in an attempt to 'catch' all targets then the mine can be easily swept. With the introduction of microprocessors into mine mechanisms, the miner has been able to significantly reduce this tolerance.

During an encounter, the mine assesses the influence signatures from the seabed as the target passes. From a magnetic viewpoint the sensor will 'see' a profile of the magnetic field at a particular depth and unknown (to the mine) offset distance, and must assess the signature changes as a function of time. The orientation of the mine sensors relative to the target is unknown to the mine and temporal considerations such as gradient and signature duration must be addressed without accurate knowledge of the geometry of the encounter or target course and speed.

Micro-processor technology provides the miner with the hardware necessary for sophisticated analysis and targeting logic. Although, theoretically, the tolerances could be set to catch one particular ship, when considering the practicalities of applying mine logic, the miner is subject to some "real world" limitations. Additionally, a miner is unlikely to have precise data on target signatures.

Development of the software algorithms for mine logic is constrained by the following factors:

- The requirement to threaten a range of possible target ships/submarines.
- The induced magnetic signature of a ship varies with heading and geographic position, while the permanent magnetic signature will change over time.
- The variations in signatures of vessels of the same class.
- The magnetic signature of a degaussed warship will vary with depth and offset distance, having reasonably complex structure in the nearer field, smoothing out as distance increases.
- A warship's magnetic signature will depend on the status of its degaussing system and magnetic treatment history.
- Magnetic and acoustic signatures can be deliberately varied as a result of passive MCM in an attempt to provide a signature outside the mine logic parameters.
- The magnetic signature of a merchant vessel will vary with the type of cargo.
- Mechanical defects, machinery operating status and transit speed affect a ship's acoustic signature.
- The acoustic influence is subject to variable propagation loss, ambient noise, multi path

transmission, reflections, temperature effects and possible interference from other noise sources in the vicinity.

In programming magnetic and acoustic logic the miner is constrained by the wide variation in valid signatures as well as the fact that the geometry of a target/mine encounter will normally be an unknown factor. Consequently the mine logic must include tolerances for the acceptance of magnetic and acoustic signatures required for actuation, and these tolerances must be wide enough to ensure an acceptable ship catching capability.

These tolerances provide the key to the practical use of TEM sweeps since the sweep does not have to simulate a particular ship signature in minute detail. Rather, it must provide a valid ship signature representing a particular class of ship.

Dyad Magnetic Emulation

One method of modelling a ship signature from magnetic ranging data is to consider the ship to consist of a large number of dipolar magnets, each of which makes a contribution to the resultant magnetic field. The Dyad Influence Sweep concept uses this modelling technique to emulate a ship signature using dipolar magnets.

A Dyad acts as a large dipolar magnet with a magnetic monopole near each end. The magnetic field for any array of Dyads can be accurately predicted using ADI developed software. When a number of dipolar magnets are placed in a linear array, they produce a quite complex combined field, the structure of which will depend on the magnetic moment of the Dyads, the number of Dyads used, the polarity of the Dyads (the direction of Dyad north and south poles in the array) and the distance between Dyads. It is this ability to modify the magnetic signature of a number of magnets in an array which is the key to Dyad Influence Sweep design.

Dyad Influence Sweeps are designed as self contained, clip-on arrays and the Dyads themselves are high strength permanent magnets which have the magnetic moment fixed on manufacture. There are two types of Dyad produced: Mini Dyads, which have a magnetic moment tailored to the emulation of degaussed warships; and Maxi Dyads, which have a much greater magnetic moment designed to provide the field intensity necessary for emulation of large merchant vessels. Variation of the physical configuration of an array provides the required flexibility in signature manipulation, negating any need for variable magnetic moments.

The signature of a sweep will be a function of the field interactions from all Dyads in the array. Variation in the number of Dyads and the configuration enables manipulation of the magnitude and structure of the



resultant magnetic signature. The length of the sweep signature can be matched to that of a ship, fulfilling the requirement for the spatial emulation.

Figures 4, 5 and 6 illustrate the wide variation in magnetic signatures which can be achieved from a one, five and two, eight Dyad Influence Sweeps and shows the flexibility of signature achievable. Figure 4 relates to emulation of a corvette, while figures 5 and 6 relate to emulation of a large destroyer. All are in a depth of 20 metres with an offset of 30 metres.

The visual presentation is with the direction of tow from left to right, ie, zero time on the right hand side.

Points of note are as follows:

- Polarity changes in the vertical and horizontal fields.
- Fluctuations in the rates of the vertical to the horizontal field.
- Total field is stable, providing a realistic hold on time.
- The signature is similar to a ship, hence gradient and magnitude limits cannot be used for sweep rejection.

Given the variation in ship signatures, all these examples would meet mine logic signature parameters. The sweep signature can be tailored to provide a viable compromise to cover a number of ships.

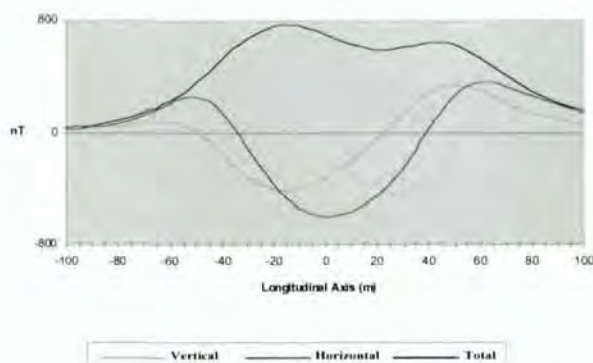


Figure 4. Five Mini Dyad Influence Sweep (Depth 20m Offset 30m)

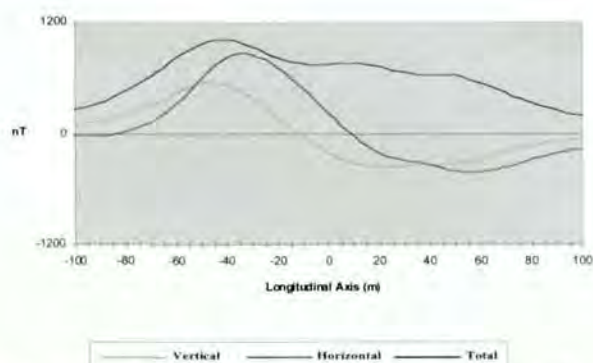


Figure 5. Eight Mini Dyad Influence Sweep (Depth 20m Offset 30m)

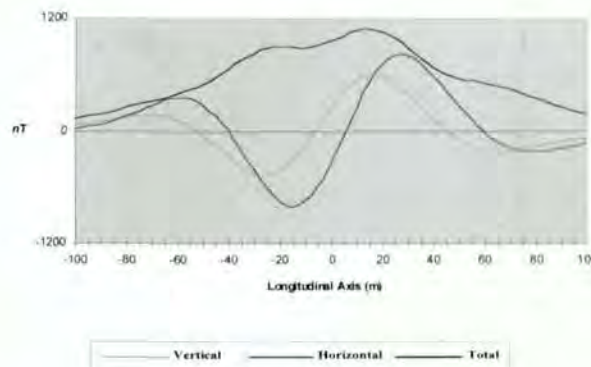


Figure 6. Eight Mini Dyad Influence Sweep (Depth 20m Offset 30m)

Acoustic Emulation

For emulation purposes, the acoustic output of the sweep should be broadband covering the infrasonic, audio and ultrasonic bands with ship-like spectral levels and include the presence of multiple, constant line structure.

The Dyad Influence Sweep can be used with a range of acoustic noise makers but ADI is developing a new generator, the ADI Acoustic Generator (AAG) which is currently at the prototype development stage. The AAG will complement the Dyads in producing a realistic emulation capability.

The AAG is being developed in collaboration with another Australian company, Resonance Technology, and with the assistance of the Royal Australian Navy (RAN) and DSTO. The AAG is a hydraulically driven, programmable acoustic module, powered by a water driven turbine. Independent of external sources for either power or control, the AAG has been designed for ease of deployment from vessels of all types, including remote control drones.

The AAG is a tubular design, 2 metres long with a body diameter of 350 mm and a weight in air of some 200 kg. The system has an output frequency from some 10 Hz to the ultrasonic, with a programmable output spectrum. It is designed for operation over a speed range of 6 to 12 knots. Comparatively minor modification to the turbine would configure the system for high speed operation, noting that the Dyad Influence Sweeps have been successfully deployed at speeds in excess of 20 knots.

The acoustic module has successfully completed both acoustic tank testing and deep water acoustic trials. The thrust of the developmental project is directed to optimising the performance of the acoustic module, mating of the acoustic module to the water turbine power source and shock hardening of the design.

The AAG, connected to a towing test rig, is illustrated in figure 7. The AAG program is fully supported by the RAN, which plans to introduce the sweep into service.



Figure 7. ADI Acoustic Generator

ADI is developing a programmable acoustic sweep, able to produce the acoustic output necessary to combat the integrated logic and signature analysis capability of the modern mine, complementing the magnetic emulation capability of the Dyad Influence Sweep.

The environment and other factors dictate that minesweeping is a necessary complement to minehunting. Significant advances in mine technology have required a corresponding development in minesweeping technology. The Dyad Influence Sweep provides a demonstrated solution in this important area of warfare.

Conclusion

Today's mine threat includes both older technology mines which are still available in large numbers, and mines utilising the most advanced technology. The sensor and integrated logic capabilities of the modern mine have significantly reduced the effectiveness of traditional minesweeping systems. A minesweeping system must now be able to provide a ship-like signature, ie. able to operate in Target Emulation Mode (TEM).

The emergence of the very smart mine influenced Australia to develop the Dyad Influence Sweep, which can be operated in TEM or MSM. The magnetic field from any configuration of Dyads in a sweep can be accurately calculated and the interaction between the sweep field and various mine sensors and logics modelled to determine the effectiveness of the sweep. Unlike traditional sweeps where mine actuation was probabilistic, Dyad Influence Sweep effectiveness is basically deterministic across the swept width.

The Dyad Influence Sweep is, to date, the only operational emulation sweep available and has been in service in the RAN for some five years. During this time operational experience, supported by DSTO analysis and foreign navy trials, has confirmed that the sweep is extremely effective against the wide range of influence mines. The Royal Danish Navy introduced the sweep into service, utilising its remote controlled minehunting drone boats, in 1996.



Exploring the Australian WW1 Submarine AE2

By Dr Mark Spencer

There was a mixture of both excitement and trepidation as I began my 72 metre plunge to the famous wreck below. Falling deeper and deeper, I was busy operating my dry-suit inflator button to equalise the ever increasing pressure against my suit, pinching my nose to equalise the pressure in my middle ear and sinuses, as well as adding more gas to my buoyancy compensator vest to offset the decreasing buoyancy with depth. All this while keeping within arms reach of the descent line and watching my wrist depth gauge. At 30 metres I would need to switch from my 32% nitrox mix (oxygen enriched air) to my 'trimix' helium mixture. As I sank deeper, the familiar terrestrial world above faded rapidly and the strange three-dimensional, weightless world of the deep took its place.

The day was October 2, 1998, and we had come to Turkey in a joint operation with our Turkish

counterparts to investigate the discovery of AE2 by Mr Selçuk Kolay, director of the Rahmi Koç Museum and the Rahmi Koç Cultural Foundation. Eighty five years ago in this very spot a battle was fought which ended the intrepid and daring escapade of the Australian submarine AE2. Only five days earlier, during the early morning hours of April 25, 1915 – ANZAC Day – the Australian E-class submarine became the first allied vessel to successfully penetrate the Dardanelles Strait and gain access to Turkey's heartland – the Sea of Marmara. This was the goal of the Dardanelles Campaign and the Gallipoli beach landings – to allow access for the Allied fleet into the Marmara and then to besiege Istanbul, removing Turkey from the war. AE2 proved it possible, paving the way for other E-class submarines.

At a depth of 30 metres, I changed regulators so that I was now breathing a specially blended mix of helium, oxygen and nitrogen. Breathing air at depths much beyond 60 metres is hazardous, especially where work must be performed. Even the oxygen in air becomes toxic at these depths, so we add relatively inert helium to knock back the concentrations of oxygen and nitrogen in our bodies. The water temperature was 16 degrees celcius and visibility was only four or five metres at best. The ever-present halocline hanging at 18 to 22 metres, with green brackish water above, acted like a blanket, cutting the light penetration significantly. It took time for the eyes to adjust to this dim twilight world.

At just over 50 metres I could make out an elliptical outline below me, a vague shape that soon materialised into the top of a conning tower. I had no doubt that this was the wreck of a submarine. I decided to land onto the rectangular casing just aft of the conning tower to prepare my camera. This was a poignant moment for me, and I allowed myself just a few seconds to absorb the significance of what I was doing. The submarine seemed essentially intact, and I had no problems imagining myself as one of the crewmen standing on the deck just as they would have so long ago. For a brief moment of time, I was connected to these brave men and felt even closer to the ANZACS than I had while standing on the beaches at Gallipoli. This was clearly the biggest, most significant surviving monument of the war effort.

I turned on my two underwater strobes (flash guns) and extended them well out from the camera on long arms. I then swam past the port side of the upper edge



Mark Spencer plunges into the water with two helium-mix tanks on his back, two oxygen-mix tanks at his side and camera equipment to survey the wreck of the AE2, 72 metres below.



of the conning tower to the forward casing. Flash, flash! I took pictures every three or four metres to capture as much information as I could for later interpretation. My companion, Merv (Nipper) Maher, swam on the other side of the casing and was taking video footage for the Channel 9 team for a later broadcast to Australian News. We swam past what was clearly the telegraphy post, just over a metre high and situated to the starboard side of the upper casing. We then passed the dip or ramp in the forward casing, which is diagnostic of the earlier 'group 1' E-class submarines. (AE2, the sister boat of AE1 was lost off New Guinea in October 1914 with all hands).

Merv and I reached the bow of AE2. I was having difficulty steadying myself for good pictures. One of the two bladders in my buoyancy vest had worked loose and the uneven collection of air to one side of the bladder was trying to tip my balance – something I had to continually work against. At such a depth you pay a high physical price for such efforts. I managed to get some shots and also took time to inspect the bow closely. Under all the netting caught up on top of the bow stem I could make out the distinctive lip of the bow edge. I wanted to see if an archive photograph of one of the earlier E-class subs (published on the Navy's AE2 website) was AE2. That photo depicted a rather battered-looking boat with the protruding lip of the bow crushed flat. AE2 did have a collision against rocks while entering Mudros Harbour only a month earlier, so it seemed plausible that the damage would still be there.

The presence of the fishing net, ropes and orange rust discolouration at the bow, are indicative of another problem which will demand attention in AE2's future management. Clearly, fishing boats are catching their nets on the submarine, and in their efforts to pull the nets free, are not only removing protective marine growth and causing rust, but also distorting the bow shape (albeit not to any great extent yet).

Merv and I swapped sides and I swam back along the starboard side of the vessel. Eventually, we reached the conning tower and still had a few minutes remaining of our planned bottom time, so we examined the features at the top of the conning tower more closely. There it was, on the starboard side. AE2's hatch to the access with the scuttle partly open and resting on a lever!

Commander Stoker had left the hatch open to hasten the

flooding of the boat so it would not fall into enemy hands. The hatch could never be opened underwater. This was clearly a scuttled submarine.

After being underwater for 18 minutes, it was time for a slow hour and a quarter ascent to the surface. At 30 metres, I recommenced breathing 32% oxygen, and at nine metres I commenced breathing 80% oxygen to speed up the removal of helium and nitrogen from my body's tissues. This build up is one of the biggest dangers with this type of diving.

On the next day, (October 3), Merv, Richard and 'Riley' dived together, and before they surfaced, Selçuk Kolay, his diving buddy Kaya Yazar and I descended with the intention of getting some photos of Selçuk on the submarine. To our surprise and disappointment, the visibility had closed in to barely more than arm's length. It was dark and disorientating so we restricted ourselves to the conning tower alone. Unfortunately, I was unable to see Selçuk clearly enough to photograph him.

October 4 was set aside as a rest day from diving. We had actually dived deep three days in a row now, the first day having unfortunately dived to a mud bottom as we had missed hooking into the wreck. A few of us visited Çannakale at the "Narrows" of the Dardanelles to download digital pictures for the Navy's website. We then visited the nearby ancient city of Troy, which reminded us of the incredible epochs of time recorded in the cultural history of Turkey events that made the events of World War One seem so very recent.

On the following day Merv and I again visited the wreck site and swam aft to explore the stern region of the submarine. Visibility had returned to a 'good' four metres and this time, I had decided to capture what little ambient light existed around the wreck site so as



AE2's AFT periscope at left, the forward periscope in the distance and the partly open hatch in the foreground. CMDR Stoker left the hatch ajar to hasten the scuttling of the vessel.



to better convey the mood of diving on the wreck. I used colour print film rated at 1600 ISO to photograph while swimming, but even then I had my 14mm lens at a wide aperture and shutter speed as slow as one eighth of a second. I discovered that my otherwise much-appreciated 35 watt underwater light was burning a path through the water like a laser beam in Star Wars. I had to turn it off for the sake of the photographs, but this meant I was unsure if what I was framing through the lens was in focus. I was to discover back in Australia that most of my exposures of the aft part of the wreck were successful, but I was not too sure at the time.

The wreck of AE2 is in remarkably good condition considering the time it has been underwater. The streamlined and rugged construction of a submarine certainly gives it a better chance of long term survival underwater, compared to a steam-ship for example. There may also be contributing factors related to the relative calmness of the inland sea above it, when compared with the open ocean, and the soft mud bottom of the sea.

Further inspection of the wreck is likely to involve corrosion testing and hull thickness measurement before any thought is given to raising the wreck, if that is indeed considered possible and warranted. Further inspection dives should also attempt to send a 'Remote Operated Vehicle' (ROV) equipped with video camera and lights into the wreck to examine the condition of the interior. It would be inadvisable from both a safety and archaeological point of view to send divers into the submarine.

The AE2 is one of the most significant war-time wreck discoveries in Australian maritime history. At a time when young Australians are demonstrating a great interest in the sacrifices of our forebears, the AE2 stands as a proud symbol of the courage, fortitude and preparedness for sacrifice for which we remember the ANZACS. The Navy's role in that historical event also deserves never to be forgotten and the submarine AE2 is a vivid symbol of the entire wartime effort of the RAN and of all who served in that conflict.

The author thanks the following persons, corporations and businesses for their valuable support to Project AE2 in either or both the 1997 and 1998 expeditions:

The Royal Australian Navy, the Hon. Bronwyn Bishop MP (then Defence, Science and Personnel Minister), Channel 9, The Australian Women's Weekly, The Rahmi Koc Group (Turkey), Thomson Marconi Sonar, Sonartech-Atlas, Turkish Airlines, Singapore Airlines, Compaq Computer Australia, Boeing Australia, Telstra, Newsnet (faxing and distribution of information to media), Pro-Diving Services, NSW Heritage Office, Extreme Clothing and Leisure Ware,

Abysmal Diving Inc (computer dive-planning program), Technical Diving International – Australasia, Maxwell Optical Industries (Coolpix 900 Digital camera), Vision Graphics Pty Ltd (film processing), Comprehensive Holiday Insurance (CHI), Apollo Australia Pty Ltd (continued dive equipment support), Kodak Australasia Pty Ltd (continued film support and the ANI for publication of this personal narrative of such a significant national event).



The Loss and Discovery of the Israeli Submarine DAKAR

A 31 Year Old Mystery Partially Solved

By Graham Wilson

In 1965, the Israeli Navy, keen to expand and update its submarine force, purchased two World War 2 vintage, former Royal Navy T Class submarines from Great Britain. One of these, the former HMS TOTEM, was commissioned into the IN as INS DAKAR. The newly acquired submarine had been launched in 1943, commissioning into the RN in 1944. Paid off into reserve awaiting disposal in 1964, she and her sister ship HMS TRUNCHEON were sold to the Israeli government in June 1965.

Although in excellent condition, the two new submarines represented fairly old submarine technology and the first task of the IN was to put the submarines into the hands of the naval yard at Portsmouth for a complete refit and upgrade. Both submarines had actually been modernised in the mid 1950s, their guns had been removed, external torpedo tubes removed, hulls streamlined and updated sonar fitted. Over the two and a half years from mid 1965 to the end of 1968, the two submarines underwent a second extensive refit which saw their power plant, communications suite and combat systems thoroughly overhauled and modernised. At the same time, the habitability of the two submarines was improved to take into account the climatic extremes of the eastern Mediterranean, a far cry from the North Atlantic where the two had originally been built to operate.

During the refit period, the crews underwent training at the RN's submarine school, HMS DOLPHIN. Finally, in January 1968, following refit, acceptance and training, DAKAR left England for Israel. The new Israeli submarine departed Portsmouth on 9 January, bound for its home port of Haifa via the Straits of Gibraltar. Aboard the submarine were 69 members of the IN – 10 officers, 1 medical officer and 58 ratings – under the command of Lieutenant Commander Ya'akov Ra'anani. For obvious reasons, DAKAR'S planned course took her well to the north of the northern African coast, well clear of the unfriendly shores of Tunisia, Libya and Egypt. DAKAR remained in constant radio contact with Israel, maintaining a regular schedule of transmissions throughout the voyage. On the afternoon of 25 January, DAKAR came up on her regular schedule and reported that she was proceeding as per plan and advised that she was currently on course, south of Crete. It was her last transmission.

When DAKAR failed to make her scheduled transmission on the night of 25 January, IN HQ at Haifa sent a routine contact message. There was no reply, either to this first message or to a series of increasingly more urgent transmissions throughout the night. Finally, by the early hours of 26 January, IN HQ was forced to admit the possibility that their submarine had been lost. At first light, a major search operation got under way with every available Israeli naval vessel steaming west towards DAKAR'S last known position. The IN ships were joined by a collection of Turkish, Greek, British and American warships, as well as military aircraft, while all merchant vessels in the area were requested to keep a lookout for the submarine, wreckage or survivors. The international search continued until 31 January with no results. After Turkey, Greece, Britain and the US regretfully withdrew their ships and aircraft from the search, the Israeli Navy continued on its own for another four days. Finally, on 4 February, the search was given up and the Israeli government officially confirmed that the submarine DAKAR had been lost with all hands, probably on the afternoon or evening of 25 January under unknown circumstances.

A number of theories were put forward in an attempt to explain the loss of the submarine. One of the most prevalent and the one which retained the most credence until recent times, was that the submarine had been struck by a merchant ship, possibly one of the early generation container ships or super tankers. Although other explanations were explored, this one remained the most popular. The submarine was in excellent condition with a well trained, although admittedly inexperienced crew, and had reported no problems during the voyage. Whatever the cause of sinking, it must have been catastrophic as the submarine went down too fast to get off even a brief distress message.

Although the 1968 search was cancelled, the Israeli Navy never gave up looking for its missing submarine. Over the next three decades at least 25 search operations were mounted as the Israelis attempted to locate the submarine and confirm its fate and that of its crew. These operations were mounted as new techniques or information came to light. For instance, in 1969, an Arab resident of Khan Younis in the then Israeli occupied Gaza Strip, discovered an



emergency buoy on the beach which was immediately identified as having come from DAKAR. This discovery led the Israeli Navy to theorise that the submarine may have sunk in Egyptian waters. The peace treaty with Egypt signed in 1979 cleared the way for search operations in Egyptian waters and a number of operations were conducted in the 1980s but to no avail.

In 1990, the Israeli Navy appointed Commodore Hadar Kimche to head a committee to examine all theories and evidence in an attempt to locate the missing submarine at last. Based on the committee's findings and taking into account new research into current patterns in the Mediterranean Basin, it was decided to conduct searches for DAKAR in the Aegean Sea. A series of operations were carried out in the area from 1992-96 but with no results. The Israeli Navy was not deterred. A second committee was set up under Commodore Gideon Raz to decide whether or not to continue the search. The committee found in the affirmative and a number of searches were carried out off the Sinai coast between 1996-97. Once again, these searches, the last of them conducted from April to June 1997, were unsuccessful.

One of the findings of the committee headed by Commodore Raz had been that the Israeli Navy simply did not have the equipment or experience for a successful search. This should have in fact been clear to the Israelis from the very first days of the search but, probably for reasons of national pride, they had not turned to outside assistance. This all changed in 1998 when the Commander-in-Chief of the Israeli Navy, Vice Admiral Alex Tal, put a personal request to the United States Chief of Naval Operations for assistance. The US Navy is undeniably one of the world's leading experts, if not *THE* expert, in locating and recovering sunken ships and to the great good fortune of the Israeli Navy, the CNO Admiral Boorda, agreed to Admiral Tal's request and placed the USN's expertise at Israel's command.

Through the US Navy, the Israeli Navy contracted the help of a US civilian Defence contractor company, Nauticos which is one of the contractors regularly used by the US Navy. While the US Navy deployed its nuclear powered SNR1 Research Submarine on a series of search operations in the Aegean Sea and off the Egyptian coast, the Israelis continued searching themselves in company with Nauticos. Working from information provided by the Israelis and their own knowledge and experience, the Nauticos team finally selected as their search area a strip of the Aegean Sea 80 nautical miles long by 2 nautical miles wide, located in the waters between Crete and Cyprus. The search in this area commenced on 9 May 1999. On 24 May, the Sea-mark towed sonar system located an object on the sea floor at a depth of 2900 metres which was thought might be the sunken submarine. A second pass confirmed the contact and precisely

located the position. Armed with the precise location, the Nauticos team lowered a remotely operated vehicle (ROV) equipped with powerful lights and cameras. The team manoeuvred the ROV to within 1 metre of the wreck and it was immediately identified as a submarine. Additionally, three senior Israeli Navy officers aboard the Nauticos ship, two of whom had served aboard ex-RN T Class submarines, identified the wreck as that of a T Class boat. It was 28 May 1999, INS DAKAR had been found.

The official announcement of the location of DAKAR after being lost for 31 years was made by Admiral Tal at a press conference held at Israeli Navy HQ at Haifa on 29 May. At the conference Admiral Tal thanked the US Navy and Nauticos for their assistance and extended his condolences to the families of the crew of DAKAR.

Attendees of the press conference were naturally curious about the condition of the submarine and the possible cause of its loss. Questions of this nature were largely fielded by the Nauticos team who were able to confirm that no remains of crew members or personal effects had been located at the site. The Nauticos representatives also stated quite clearly that at this time they were totally unable to provide a reason for the loss of the submarine. The most that they would say was that examination of the wreck seemed to rule out the possibility of the submarine having hit or been hit by a merchant vessel. Both Nauticos and the Israeli Navy fended off questions about the possibility of raising the submarine. The Nauticos team in particular went into some detail about the difficulties of raising a wreck from such depths and the difficulties of preserving the wreck itself. Further remote examination of the wreck will be carried out in an attempt to find out once and for all what sunk the DAKAR. In the meantime, the families of the crew at least now have the comfort of knowing for sure that their loved ones are actually dead and also knowing where they lay.

For the record, aboard INS DAKAR that last day in 1968, still aboard and "on patrol" are:

LCDR	Ya'akov Ra'anani	Commander
LCDR	Avraham Barkai	XO
LCDR	Binyamin Mainon	Engineer
LT	Schlomo Ofek	
LT	Shimon Ran	
LT(JG)	Zvi Har-Even	
LT(JG)	Yoseph Lahar	
LT(JG)	Ya'akov Maor	Doctor
LT(JG)	Arieh Paz	
LT(JG)	Gideon Segal	
LT(JG)	Reuven Snapir	
SCPO	Avraham Atari	
SCPO	Michael Hadar	
SCPO	Ze'ev Kol	
SCPO	Dan Manor	



SCPO Yechezkel Mizrahi
SCPO Raphael Rafali
SCPO Amono Ron
SCPO Ya'akov Ron
CPO Nissim Cohen
CPO Zvi Tal
PO1 Zvi Prag
PO1 Yehuda Ronen
PO1 Avraham Shahar
PO1 Amnon Tamir
PO1 Mordechai Tarshi
PO2 Moishe Arel
PO2 Haim Bar Ze'ev
PO2 Yoseph Barnea
PO2 Avraham Baz
PO2 David Ben Shalom
PO2 Yoseph Dvi
PO2 Yoseph Farhi
PO2 Reuven Gal
PO2 Oded Madmon
PO2 Yoseph Shalev
PO3 Aharon Aharon
PO3 Yoseph Almog
PO3 Eliezer Ben-Zvi
PO3 Israel Carmi
PO3 Menachem Dagani
PO3 Azriel Dror
PO3 Nimrod Drori
PO3 Moishe Gadish
PO3 Michael Gal
PO3 Yehuda Galili
PO3 Eli Kadosh
PO3 Ya'akov Mizrahi
PO3 Menachem Narkiss
PO3 Yoseph Netzer
PO3 Betzadel 'Ozeri
PO3 Yitzhak Ogen
PO3 Amnon Paz
PO3 Zvi Paz
PO3 Avraham Ron
PO3 Ya'akov Ronen
PO3 Meir Safran
PO3 Yechezkel Sasson
PO3 Binyamin Shaked
PO3 Haim Shani
PO3 Alexander Sharoni
PO3 Eliezer Sharoni
PO3 Yuval Schmuely
PO3 Schlomo Vardi
PO3 David Yanai
PO3 Meir Yarom
PO3 Yeshayahu Yochai
PO3 Zvi Zahavi
PO3 Yoseph Zohar

One aspect of the tragic loss of INS DAKAR which reflects enormous credit on the Israeli Navy is its refusal to give up the search. Following up every lead, going back over previous ground again and again, taking advantage of new information, equipment and techniques, the Israeli Navy never gave up the search for 31 long years. In the end, this persistence paid off. The smallest and probably, in Israeli eyes anyway, the least glamorous of the IDF's three arms, the Israeli Navy is still one of the bulwarks of Israel's defence. Israel is a small nation with a small population surrounded by a sea of enemies and potential enemies.² The Israeli government has always recognised that you can always buy more tanks, ships and aircraft but people are irreplaceable. As a result, the IDF goes to extraordinary lengths to rescue its wounded and recover its dead. The history of the Israeli Army and Air Force are replete with tales of bloody operations mounted to rescue downed aircrew or recover the bodies of dead soldiers. That more people were often killed or wounded in the recovery operations than were missing in the first place is, in somewhat of a contradiction, immaterial. The fact of the matter is that every soldier and airman knows that he or his remains will be recovered and brought back to Israel, either for medical care or burial, if it is at all possible. The 31 year search by the Israeli Navy for its missing submarine and crew is a clear indication that the Israeli Navy takes care of its own every bit as well as the Israeli Army and Air Force.

NOTES

1. For those who might like an "X File" note to the story of DAKAR, LCDR Barkai's brother, retired Vice Admiral Michael ("Yomi") Barkai, one time Commander-in-Chief of the Israeli Navy, died on 28 May 1999, the day DAKAR was located and identified!
2. Israel depends for its survival on itself alone. It recognises only two types of non-Israelis – enemies and neutrals. I can't say I blame them.

The Process of Bringing a New Capability into Service

HMAS HUON – The First of Class

By Commander Geoff Uren RAN, Commissioning Commanding Officer

On 12 August 1994 a contract was awarded to ADI LTD for six Italian designed HUON Class minehunters and associated support.

The hull of HUON, the first of class, was constructed at Intermarine SPA shipyard in Italy in order to meet the contracted delivery schedule. The bare hull arrived in Australia as deck cargo on 31 August 1995 for outfitting at ADI Minehunter Newcastle facility. The ship was subsequently launched on the 25 July 1997 which, incidentally, coincided with my post in date as the Commanding Officer.

HUON is a 720 tonnes, 52.5 metre ship propelled by a V8 diesel engine driving a controllable pitch propeller for transiting purposes (14 knots maximum). For minehunting three retractable thrusters are provided (6 knots maximum). She is fitted with a fully integrated combat system, including the Nautis-II tactical data system and Type 2093 variable depth minehunting sonar, a precise navigation system, manoeuvring and hovering system and the latest communications fit. For mine disposal HUON is equipped with two Swedish Bofors Double Eagle mine disposal vehicles. For self defence a 30mm-sight stabilised gun, electronic support measures and chaff system are installed. In addition the ship is fitted with the lightweight mechanical minesweeping system.

The officers and crew commenced MHC specific systems training shortly after the ship was launched. The training provided was lengthy, some nine months for engineers and four to six months for operator training. The training provided was of a "best endeavours approach". To be more specific it is extremely difficult to train personnel in systems that are yet to be completed with only 10% documentation available. To be fair the sub-contractor did an excellent job and the crew felt confident to take the ship to sea.

Under ADI's flag but with a RAN crew Contractor sea trials commenced on the 25 June 98 and were to last nine months. The trials programme was intense and great strides in the ship's operating performance were achieved. The ship's company worked long days for weeks at a time, mostly off the coast of Newcastle, NSW. A constantly changing trials programme did not allow for pre-planning, however, it is with great credit to the leadership skills of my officers and senior

sailors that morale in the ship throughout the sea trials remained extremely high. Along with this, the relationship between the crew and the Contractor was key. It has to be remembered that HUON at this time belonged to ADI and we the crew were agents of the company and operated the ship under their control. As a Commanding Officer this lead to some very frustrating moments, but the bottom line was that we all (ADI and the RAN) had a goal to achieve. That goal was to deliver the first MHC on time and within budget.



HMAS HUON departs Sydney Harbour.

HUON was delivered to the RAN 25 March 1999, the ship was now ours, however, like any brand new piece of equipment she was under warranty. The next milestone in the ship's life was commissioning which occurred at HMAS WATERHEN on 15 May 1999. It was a day the commissioning crew will remember



with extremely fond memories. To say I was proud of the crew for what they achieved so far in the ship's life and the way they conducted themselves is an understatement. Words can not express the emotions one has on such a special occasion.

As HMAS HUON, we have so far deployed as far North as Darwin and South to the ship's namesake, the Huon Valley in Tasmania. The ship has participated in a major MCM exercise, completed numerous RAN trials and been involved in a SAR operation that attracted a great deal of media attention. Throughout this time the ship has experienced a number of problems which have been rectified mostly through warranty claims. Despite the problems that have arisen HUON has so far lived up to all expectations. She is the most modern and well-equipped Minehunter in the world. Engineering wise she has proven reliable and the combat / tactical data system and associated equipment although still requiring further development and fine tuning have

proven that Australian taxpayers have spent their money wisely.

Bringing a new class of vessel into RAN service has been a very challenging and rewarding experience for not only myself but for all the officers and sailors that have served in HUON. It would be wrong of me to say that any one individual has contributed more than another has. I have been extremely fortunate to have a dedicated professional group of sailors who have contributed and worked tirelessly without complaint to make HUON and the remaining five MHC's the best they possibly can, and I thank them all. However, the greatest reward will be in five to ten years time stepping back onboard to hopefully see the standard operating procedures, the ideas and innovations that we as the first crew developed. It was with much regret that I posted off HUON in April and I envy my relief who will take on a ship that is Australia's minehunting future.



HMAS HUON in Tasmania's Huon Valley.



The HUON Class

Reflections of a Junior Officer Under Training

By Lieutenant Robin Dunk

As I leaned over the balcony of HMAS WATSON last year, lemon squash in hand, there was the buzz of excitement among my classmates. "What kind of ship is that?", I heard one ask. "Perhaps a potential replacement for the Fremantle Class", I heard one wizen young salt pronounce. "Ahh", "oh", and general agreement abounded. "How fast do you think?", another asked. "Doesn't look like a Bofors up forw'd", expounded another. "Looks sleek though eh, have to be good for 25 knots plus", I heard and could bear it no longer.

"It's HMAS HUON", said I. "First of a new class of Mine Hunter", I corrected my misguided friend, "and I don't think she'll do much more than 20 knots. It's where I plan to be posted when I finish here" I think to myself, as I watch her sail silently past on her way to berth at HMAS WATERHEN, "Well, speed isn't everything I suppose!"

Nearly six months of hard work later I was rewarded with a posting to HUON to earn my Bridge Watchkeeping Certificate. Standing on the pier at WATERHEN, cap in hand, I looked over her externals with bewilderment. I couldn't believe how much equipment is crammed onto the Quarterdeck (that's

the Sweepdeck to us in the know!). Two Double Eagle Mine Disposal Vehicles, a recompression chamber, two ships boats and more. Very little space is wasted.

Apart from a 20 minute tour over HUON about three months prior, my only contact with a Mine Hunter/Sweeper was as a small boy onboard my Uncle's ship, HMAS IBIS. With the words of my Uncle still ringing in my ears, "Only gentlemen go to Hunters and Sweepers" (he paid off a 'few' years ago!), I take my first steps into the Navy's newest ship and the latest in the world of Mine Warfare.

How the years (and a few extra centimetres of height) alter the way in which we view the world. As a child, I thought IBIS was a large and mighty looking ship, although I recall her rocking around a lot on the wake of a passing boat! At 52 metres (just over 170 feet), HUON is a couple of metres longer than a Fremantle Class Patrol Boat, yet at 720 tonnes she displaces nearly three times as much. Complete with a fully functioning Operations room, cutting edge mine detection and disposal technology, and an extensive defensive armament fit, the HUON Class Mine Hunter Coastal (MHC) are every bit a warship.



HMAS HAWKESBURY during trials in Newcastle Harbour. Fort Scratchley can be seen in the background.

The MHC class is an interesting mix of technologies, the very latest electronics and hull construction, combined with tried and true machinery to ensure that the objective is always achieved and the ship makes it home. The ship is minimum manned and nearly all onboard systems have double or triple redundancy. Operations room repeats on the bridge, bridge repeats in the Ops room, and a Control and Management System (which does practically everything else) which allows the Bridge to double as the Machinery Control Room (MCR) in an emergency. With cameras covering both the Sweep and Boat decks and a combination of computers that monitor nearly all onboard activities, it also means that it's nearly impossible to hide! Enough to cause nightmares for any junior officer!

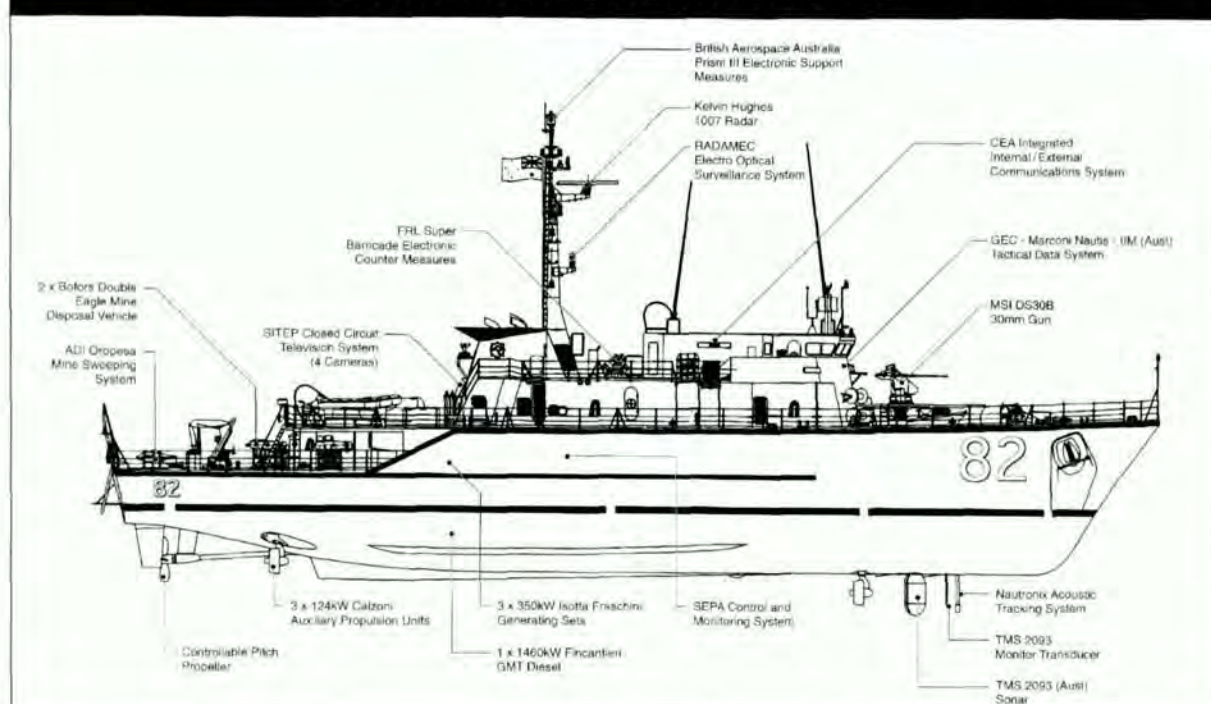
If I thought the externals were bewildering, I hadn't seen anything yet. The level of technology employed aboard, with the exception of perhaps the Collins Class submarines and the ANZAC frigates, is unique to the Fleet, at least to the Fleet as I know it. The Damage Control systems, for example, part of the previously mentioned Control and Management System, embrace the latest advances in DC and fire-fighting technology employed in modern merchant shipping, and do everything except actually fight the fire (and it even does that in some spaces!). The system is so advanced that it calls for special attention to the way the Navy instructs DC and fire fighting. The computers know where, and most likely what, is burning, smouldering or flooding, well before Standing Sea Fire Brigade arrives on the scene. (But while the system is advanced, it is yet to detect a midnight raid on the Galley; somehow the Chef still manages that by his wits alone!)

For a small ship, the living conditions onboard are first class. Like any good trainee, I'm given a rack in the trainee overflow nine berth mess. Expecting to find a 'coffin' style bunk, I'm pleasantly surprised to find a rack about the same size as that found in the Wardroom of an FFG. With a head and shower between nine (usually only four or five are actually there to use it though), it is sheer luxury. Having last lived in 3-Fwd Mess in an FFG, there's quite a noticeable difference! There's more than enough fresh water on board, meaning that 'two push' showers are a thing of the past and the ship's air-conditioning system could make a penguin shiver.

"So how does she handle", I hear you ask. With a maximum continuous speed of 14 knots she is certainly not the slow boat to China, but she's no "Real Mans Porsche", either. Outright speed is not required in the line of work the HUON class are built for. Fast enough to get to any area of operations around the country in good time, it's in the mine-hunting mode where an MHC comes into her own. With the three auxiliary propulsion units lowered and the main engine secured, an MHC moves through the ocean as a helicopter does in the air, just a little slower. It's also one of the only ships in service where the Ops room takes full control (including conning), leaving the Officer of the Watch as a highly paid lookout!

"But what about your personal thoughts about the ship, y' know, the low-down?" you ask. I'll tell you at the end of August, once we've returned from a three month deployment 'up top', taking in Singapore, the Philippines and Brunei, not to mention Cairns and Darwin. Not bad for ship of HMAS HUON's compact size!

Huon Class Minehunter





Shots from the Past

This article originally appeared in the Journal of the Australian Naval Institute, November 1977

The Navy and the Olympics

By Lieutenant Commander W. M. Swan RAN (Rtd)

It might be well asked what is the connection between the fighting Services of a country and the Olympic Games. Surely these two important aspects of international life are diametrically opposed; one symbolising conflict (or preparation for it) and nationalism, and the other sport, games and goodwill between nations. However, there has been, and can be, a strong link between these outwardly very differing aspects of human endeavour. The Services are, and should be, very involved in sports and games and, in my experience, have always taken their recreation quite seriously. Some of the most formal conferences I attended during my service in the Royal Navy concerned sport, and while PT & Sports Officer of HMS COLLINGWOOD in 1948 I had 22 acres of playing fields to use and kept a watching brief on 15 sports and games from cricket to gliding. In this same year I was fortunate enough to attend the XIVth Olympiad at the Wembley Stadium, London, where J.E.W. Mark, the Cambridge runner, lit the Olympic flame to inaugurate the first post-Second World War Games.

After the usual long negotiations, the XVIth Olympiad for 1956 was awarded to Melbourne, the first time Australia had been so honoured. I was at this time Commanding Officer of HMAS LONSDALE II at Williamstown. When this Establishment was closed down late in 1956 I was appointed Staff Officer (Olympics) to NOICSEA, then Captain John Walsh. The duration of the Melbourne Olympics was from 22nd November to 8th December and I arrived at HMAS LONSDALE, Port Melbourne (where NOIC and his staff were located) well before this to find preparations well in hand for the considerable naval participation in Games matters. I was set up in the office of Lieutenant Commander Bill Rogers, the SO (Operations), who had already done much planning, and with us we had a civilian Mr Brogan, who became a most valuable member of our Olympics team. The Executive Officer was Commander Bob Hunt (of hydrographic fame) who had been snowed under with Olympic arrangements for some time. Captain Walsh explained to me the information booklet we were producing for visiting naval ships, titled OLYMPICS MELBOURNE NAVAL INFORMATION – short title OMNI. We, and ships of visiting nations, were to find OMNI an invaluable aid.

Two questions now arise. Why was I chosen as SO (Olympics) and why was the Navy so involved? I was chosen because, as a specialist PT&W Officer, Olympics were part of my duties (vide Naval Handbook on PT & Sports) and I was “between appointments”. The RAN was very involved as not only were a number of warships visiting Melbourne for the Games, but the RAN was providing much assistance to the organising committee in men and material. It is a popular misconception that the Navy is only involved in ships and the sea. Admittedly this is its prime task, but the Navy holds big assets ashore, dockyards, drill halls, slipways, buildings, warehouses, houses, boatsheds, offices, garages and vehicles, not to mention possibly the largest number-of-items store inventory in the Southern Hemisphere. In addition, it possessed yachting expertise and ships to lay the marker buoys for the Olympic sailing races in Port Phillip, guards of honour, and sentries to guard valuable equipment. All this added up to halls for fencing practice, gymnasiums for the gymnasts, moorings for yachtsmen, assistance generally and, finally, the marshalls. A team of sailors, led by Commander Duncan Stevens, was formed to show patrons of the games to their seats – a nice touch of public relations.

The 12 venues for the events were the Melbourne Cricket Ground as the main stadium, Olympic Park, the Exhibition Building and its annexe, West Melbourne Stadium, St Kilda Town Hall, Williamstown Rifle Range, RAAF Station Laverton, Port Phillip Bay, Broadmeadows, Oaklands and, 70 miles west, to Ballarat for the rowing and canoeing. I had hardly settled in when my desk was flooded with bids from the public to entertain men in the dozen naval ships due to visit Melbourne for the Games, an armada led by the Royal Yacht BRITANNIA bringing HRH The Duke of Edinburgh who was to open the Games. One small complication was that many people did not realise there was an Admiral in BRITANNIA – FORY – Vice-Admiral Able-Smith. Invitations for American sailors arrived in a torrent. I dealt mainly with the office of Mr P. W. Nette, the Administrative Director. Bill Rogers coped mostly with the ships’ operational requirements, berths and berthing and slipping parties, victuals, fuel and water. Mr Brogan



battled with the mountains of files and memoranda, and phone calls all day.

There were 11 sub-committees in Melbourne organising the Games. Captain Walsh sat on the Technical Committee chaired by E.J.H. Holt (who had been Director of Organisation at the London Games in 1948), the Hon. W. S. Kent-Hughes was Chairman of the Organising and Executive Committee, and the Prime Minister, Mr R. G. Menzies was the President of the Games. As the Games are always awarded to a city, the Lord Mayor, Sir Frank Sellick, and his Council were the hosts for the XVIth Olympiad, with the various committees staging the actual events. This meant that the thousands of visitors to the city, including the naval men, were a matter for the Town Hall, with its various officials and civic committees. NOIC and I attended meetings there under the chairmanship of Councillor (later Sir) Maurice Nathan, where we arranged functions and entertainments. One of our colleagues in this was Don Chipp, later a Federal Cabinet Minister, and another live wire named Miss Taft.

Busy as I was, I somehow managed to be at the Main Stadium for the opening ceremony on the afternoon of Thursday 22nd November. The weather was perfect and the Melbourne Cricket Ground, with its new stands, was packed with people from all over the world. It was a memorable and historic occasion, commencing with displays by bands with that provided by the RAN Band being outstanding. Bandmaster Lieutenant George Hooker RAN staged a thrilling display, with the Bandsmen marching around in the five overlapping Olympic circles while playing. To all who witnessed this, George's inclusion in a later Honours List was no surprise.

I feel the RAN performed its many Olympic tasks most creditably, and of course one must not overlook the many Naval Reserves who were assisting in one way or another, not the least being Lieutenant Commander Lloyd Burgess, then Secretary of the Royal Sydney Yacht Squadron, who was officiating at Olympic Yachting HQ at the St Kilda Yacht Club.

When, and if, Sydney is awarded the XXIVth Olympiad in 1988 and stages it mainly on the Homebush (?) site, I am sure the RAN will step forward once again to help make sporting history and promote goodwill among the nations of the world.

