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NOVEMBER 1984
NUMBER 4

JOURNAL OF THE AUSTRALIAN NAVAL INSTITUTE

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AUSTRALIAN NAVAL INSTITUTE

1. The Australian Naval Institute is incorporated in the Australian Capital Territory. The main objects of the Institute are:
   a. to encourage and promote the advancement of knowledge related to the Navy and the maritime profession,
   b. to provide a forum for the exchange of ideas concerning subjects related to the Navy and the maritime profession, and
   c. to publish a journal.
2. The Institute is self supporting and non-profit making. The aim is to encourage discussion, dissemination of information, comment and opinion and the advancement of professional knowledge concerning naval and maritime matters.
3. Membership of the Institute is open to —
   a. Regular Members — Members of the Permanent Naval Forces of Australia.
   b. Associate Members — (1) Members of the Reserve Naval Forces of Australia.
      (2) Members of the Australian Military Forces and the Royal Australian Air Force both permanent and reserve.
      (3) Ex-members of the Australian Defence Force, both permanent and reserve components, provided that they have been honourably discharged from that Force.
      (4) Other persons having and professing a special interest in naval and maritime affairs.
   c. Honorary Members — Persons who have made distinguished contributions to the naval or maritime profession or who have rendered distinguished service to the Institute may be elected by the Council to Honorary Membership.
4. Joining fee for Regular and Associate members is $5. Annual subscription for both is $15.
5. Inquiries and application for membership should be directed to:

The Secretary,
Australian Naval Institute,
PO Box 80
CAMPBELL ACT 2601

CONTRIBUTIONS

In order to achieve the stated aims of the Institute, all readers, both members and non-members, are encouraged to submit articles for publication. Preferably, submissions should be typed, double spaced, on A4 paper; the author's name and address must be shown clearly, even if a pseudonym is required for printing purposes; to be eligible for prizes, original articles must be accompanied by statements that they have been written expressly for the ANI; and short biographies will be welcomed. The Editor reserves the right to reject or amend articles for publication.

DISCLAIMER

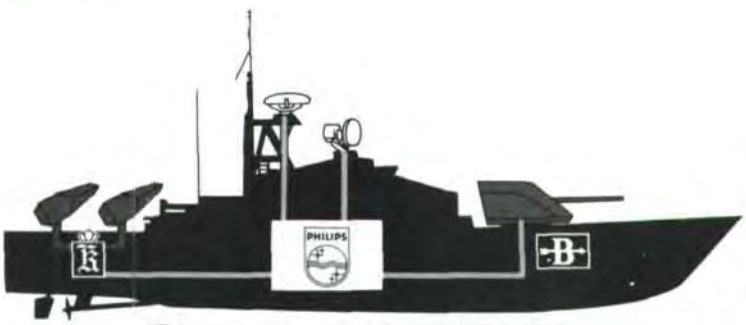
ISSN 0312-5807

CONTENTS

Cover Photo: Supplied by Lieutenant Commander N Bell.

Courtesy of *HMS VERNON*

Royal Swedish Navy has taken delivery of Hugin-class patrol boat no.14 in a series of 16.
Length: 36.4 m. Displacement: 150 tons. Speed: 30+ knots.
Complement: 18.



SCANFIRE

- Bofors all purpose gun 57 mm/ L 70.
- Kongsberg SSM Penguin Mk 2.
- Philips combat & weapon control system 9LV 200.

This powerful weapon package is proposed for the R.A.N. Freemantle class FPB.

PHILIPS ELEKTRONIKINDUSTRIER AB
Defence Electronics. S-17588 Järfälla, Sweden.
Tel. Int. +46 758 10000. Telex 11505 philja s.

PHILIPS

Correspondence

Trenchard

Dear Sir,

I feel compelled by quixotic admiration for a matrimonial ancestor to take issue with CDRE Robertson's use of the term Trenchardist dissension (May 84). History, I believe, has shown that there is a place for independent air forces and that the dissension of the 1920s and 30s was no different to today's fight for the defence dollar. Consecutive First Sea Lords and CIGs could possibly have spent their time more profitably ensuring that air power was developed to meet the national defence needs rather than trying to destroy the RAF, although the between-wars British development of the other two new major weapons, the submarine and the tank, give no confidence that the aircraft would have fared any better.

Perhaps, with the benefit of hindsight, in a more co-operative atmosphere the Fleet Air Arm would have reverted to the RN earlier and both it and Coastal Command would have been better equipped at the outbreak of WWII. Regrettably, the nett result was long range RAF bombers suffering heavy casualties dropping their bombs on average 14 miles from their targets, while merchant ships carrying essential war material suffered equally badly for the want of air support.

Trenchard had strong views on the relative merits of mobile versus fixed defences and argued strongly against the naval guns planned for Singapore. He lost that argument and the British lost Singapore. Perhaps if Trenchard was truly a 'man of vision' he might find a parallel in Australia's decision to rely on fixed shore bases rather than carrier based airpower for maritime operations.

Trenchard was right about independent airforces, but at the same time most maritime nations also developed a strong naval air arm. In fact, except for a few Commonwealth countries, most nations today have an independent air force plus a naval air force. This is probably the key to Tom O'Brien's headquarters problem (Feb 84). Most other countries would not see the need for a 'maritime' headquarters. they would simply have a naval headquarters, to command the operation of airpower at sea.

Peter Coulson

Midshipmen's Journals

Sir,

Many retired (and still serving) naval officers must sometimes wonder about the best fate for the journals over which they laboured as midshipmen. May I suggest that anyone seeking an appropriate resting place for a journal consider the Australian War Memorial as custodian or recipient?

As described in an article in Volume 7, Number 4 (November 1981) of the Journal, the Australian War Memorial is charged with developing and maintaining a national collection of historical material and with conducting and assisting research into Australian military and naval history. Historical research of the wide ranging nature envisaged demands a range of sources including personal documents (i.e. journals, diaries or photograph albums) to provide a different perspective to that of formal records.

Not only wartime journals are valuable historical documents. *Any* journals are of great value; indeed it has been said that a 1920s or 1930s journal is more valuable than a wartime journal because it portrays a naval world that has now gone, so often leaving its only traces in those journals.

The War Memorial prefers to receive an outright gift of documents without strings, but is prepared to photocopy then return documents or to return a photocopy and retain the document if the owner prefers that. Long term loan to the War Memorial is also possible.

A member who wishes to see his journal (or diary) looked after professionally and added to that core of historical documents from which history is written is urged to contact the Australian War Memorial. The address is:

The Director
Australian War Memorial
PO Box 345
Canberra, ACT 2601

Yours faithfully,
R.M. Jones

Reserve Members

Dear Sir,

I too am delighted that both Captain Swindells and Commander Pennock wish to re-kindle the fire of discussion under the status of RANR membership of the Australian Naval Institute.

I am appalled that only 12% of the total membership of the Institute at the SGM held on 19 February 82 were present and able to vote against, on behalf of *all* members, the motion to change the definition of 'Regular Members'.

In view of the extremely small numbers who were present at this SGM vote, I heartily endorse Robin Pennock's suggestion to reinstate the subject once again but this time to circulate, by means of a loose leaf ballot paper, all members of the Institute.

If regular membership is extended, many serving members of the RANR, who currently see themselves as second class citizens in the eyes of the ANI, would willingly join the Institute, thus bringing a much broader background of interests and contributions.

Yours faithfully
R.J. Holmes
Lieutenant Commander RANR

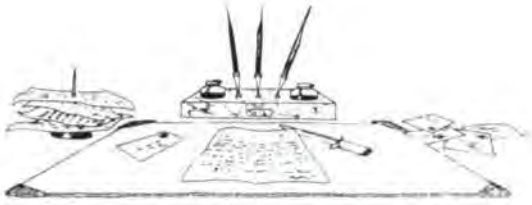
Maritime Strategy

Sir,

I applaud LCDR S. Rowley, RAN, for his article published in Vol 10 Number 3, August 1984. A well reasoned paper that is both readable and informative.

I know that our masters have said 'forget about a carrier and get on with living', and I agree that that is all we can do, but I implore all authors who can show the benefits of organic air to do so in any and all forums. It (air protection) will only come about if the unprotected seafarer tells the populace about the inherent danger without it. Our friendly but unsympathetic Airforce and PS counterparts are not about to change their minds unless we keep them informed of the great threat to the survivability of a surface unit without its own air support (whether the unit is within short range of the Australian coast or mid ocean).

E.A. Power



CHAPTER NEWS

MELBOURNE CHAPTER

The Melbourne Chapter held its inaugural meeting on Monday 21 August, 1984. CDRE V A Parker, was elected Convener/Treasurer, and CMDR N G R Daniel RANR Secretary.

It is intended to hold meetings in February, May, August, and November, on the fourth Monday of the month, commencing at 1800 at the *Royal Melbourne Yacht Squadron Clubhouse, St Kilda*. Each meeting will have a guest speaker to talk on naval or marine matters. Prospective members and visitors are welcome.

The next meeting will be on Monday 26 November, 1984, when Captain J A Noble will speak on *Sailing Ships' Navigators*.

N G R Daniel
Secretary

FROM THE EDITOR

The theme for this journal is mine warfare. Readers may find some overlap in the articles but this should not detract from the sincerity and intensity of the messages the authors are trying to convey. The recent report from the Joint Parliamentary Committee on Defence and Foreign Affairs said 'Australia should develop within its maritime defence forces a small but highly capable mine countermeasures capacity'. All our authors would agree wholeheartedly, as would Tom Friedmann whom I am glad to welcome back on the US scene. My fervent hope is that these articles will produce some other articles or letters, in support or rebuttal, from our readers!

One of our regular contributors over the years has written in to explain his silence recently: the USNI has just published *The King's Ships Were at Sea* by Lieutenant J.V.P. Goldrick RAN, list price $23.95, members' price $17.57. I hope to have a review in the next journal, and meantime offer the Institute's congratulations. A former editor has also published recently, and a review of Captain Sam Bateman's work will be found at the end of the journal.

Somebody else who writes regularly to the lonely editor is Mr Eric Jehan. He has recently given me details of the Sydney Maritime Museum: you can be a journal or a working member (to help restore the *James Craig* and other historic ships) for $11 pa — the first two volumes of their journal *Australian Sea Heritage* have just been published (there will be 4 pa) — and their address is Sydney Maritime Museum, Birkenhead Point, Drummoyne, NSW 2047.

For the first time in my experience as Editor, we have a surfeit of articles, so my apologies to those whose pieces have not yet appeared in print. I am delighted that there is a lively response to my requests for submissions and hope even more of you will be encouraged to write. In particular, I would like some of the smaller pieces such as Technical Topics or Nobody Asked Me But, and there is always room for articles by sailors and junior officers. Would you all please think about recruiting members and/or articles?

Geoff Cutts
(062-654673)

1983-1984 PRESIDENT'S REPORT

It is with pleasure that I report the proceedings of the Australian Naval Institute for 1983-84.

The highlight was undoubtedly Seapower 84 held in April and opened by our Patron, His Excellency the Governor-General. The theme *Australia's Maritime Interests* attracted a distinguished panel of speakers from different walks of life thus ensuring strong support from members and a cross section of the public. The proceedings of our third national seminar have been published and in addition to distribution to attendees, about 80 copies have been sent to selected parliamentarians, defence journalists and influential members of the community with responsibilities or interest in maritime affairs. The success of the Seminar was due, once again, to the hard work of a small number of members, their wives and their friends. Three deserve special mention — Commander David Campbell, Seminar Director during the formulative stages, Commodore Nobby Clarke who took over at short notice, at a critical stage three months before the Seminar and Commander Ian Noble for a most successful advertising revenue campaign.

Whilst Seapower 1984 has been our most demanding activity important progress has been made in other areas.

Credit is due to the Editor and his dedicated team of assistants for the continuing high standard of the Journal. Whilst there is no shortage of contributions I would like to encourage more contentious articles as well as more from younger officers and sailors. The cover of the Journal is now printed in colour as a regular feature and this reflects the success of advertising which now consistently offsets a major part of publication costs.

During the year, ANI Silver Medals were presented to Lieutenant Commander R.J. Willis RAN and Lieutenant Commander S. Rowley RAN, students at the RAN Staff College, for their essays on maritime strategy which have been published in the Journal.

In my 1982-83 President's Report I advised that the Institute had continued to consolidate its position by achieving a further prudent surplus. I was concerned at that time, however, about some aspects of the handling of the Institute's financial affairs; these had resulted in some embarrassment for members and the Council.

I am pleased to report that during the past 12 months these concerns have been cleared up. The Institute's finances have been subjected to the most careful scrutiny and a number of matters which have been outstanding for considerable periods of time have been sorted out. On my own, the Council's and your behalf I would like to thank our Treasurer, Commander Peter Coulson, and his wife, Lieutenant Sandy Coulson, also a Councillor, for the work they have devoted to this task.

Despite the fact that some bad debts had to be written off, the year has again been financially successful. Over the year the ANI's accumulated funds increased by approximately $2700, but most of this came from interest.

During the year a strenuous campaign was conducted to remind members who were not financial, of their obligation and the Council's intention to rescind the membership of unfinancial members. As a consequence, some 72 former members were deleted from the Membership List. Many of these were at least two years in default of their subscriptions.

On a brighter note 57 new members, including 24 associate members, were enrolled giving a total of 590 financial members at the end of the year. Based on present trends, the Institute can look forward to a modest net growth rate of less than 5 per cent in the coming year.

An important development was the signing in November 1983 of an Agreement for the Computerization of ANI Records. These computer support arrangements have been most satisfactory with a consequent improvement in administrative efficiency and reduction in burden on councillors. The critical conclusion is that, with these arrangements in place, there is no immediate need for part time clerical support.

Steady progress has continued to be made with the library and revised lending arrangements have been promulgated in the Journal. Proposals for future development of the library, including a photographic library, are under consideration.

Whilst the overall level of chapter activity has been disappointing, a small number of meetings were held in Canberra, Perth and Sydney. Encouraging developments following Seapower 84 have been plans for the revival of the Melbourne Chapter and for the formation of a new Chapter in Brisbane.

Overall, 1983/84 has been a satisfactory year. Seapower 84 was a success; the Journal's standards have been maintained; and, with some minor exceptions, notably objectives relating to membership growth and chapter activity, the Council's objectives for the year have been achieved. Difficulties associated with financial management and overdue membership fees have

been resolved and important progress has been made in administrative support arrangements.

The Institute celebrates its tenth anniversary on 10 June, 1985.

12 July, 1974 — A meeting of officers resolved to form a 'Naval Society'.
4 April, 1975 — Special General Meeting.
10 June, 1975— Formal Incorporation.
August 1975 — Journal Volume Number 1 published. This contains a record of 'How it Began'.

Since its inception, the record of the Australian naval Institute has been one of steady progress. The financial position is sound, membership has grown to a very respectable number and the Institute continues to achieve wider recognition through the Journal and its national seminars.

The Council recognises 1985 as an important milestone in the ANI's history. At the same time, we consider that the Institute is, or at least may be, at the crossroads. In the past year, membership has fallen slightly, the Seminar was mainly attended by old faithfuls, and the willing few continued to bear a considerable administrative burden.

I believe that we need a better idea of where the Institute is heading in the longer term.

With this in mind, the proposed Council objectives for the coming year have been set with particular care, and subject to endorsement by the incoming Council, will enable an examination of the way ahead. The key objective is: 'In the light of 10 years' association, examine whether any significant changes should be made to the ANI to further its aims'. At the next AGM I hope to be able to report the results of this examination.

In conclusion, may I express on my own behalf and on behalf of members, appreciation for a job well done by all councillors. My personal thanks are due to all the retiring councillors as well as those remaining. The changeover is two thirds this year, so, once again in 1985, there will be a challenge to old and new councillors alike.

Since becoming President, I have particularly valued the counsel and support of the retiring Vice-Presidents, Commodore Jim Dickson and Captain Peter Dechaineux. Commander Geoff Cutts has made a contribution of unequalled consistency and effectiveness as Journal editor and by his efforts to improve administrative efficiency. Also this year, the dedication of the outgoing Secretary Lieutenant Mark Fitzpatrick has been particularly noteworthy.

Finally I would like to record the Council's appreciation for the continuing support of all members.

Paul Reis A.A.S.A.

PUBLIC ACCOUNTANT

Correspondence to:
P.O. BOX 20
MAWSON, A.C.T. 2607

Telephone:
(062) 811566

ROOM 207
2ND FLOOR
MLC TOWER
PHILLIP A.C.T.

18th October, 1984

The President,
The Australian Naval Institute Inc.,
P. O. Box 18,
DEAKIN. A.C.T. 2600

Dear Sir,

Please find attached various Operating Accounts and Income and Expenditure Account, and Balance Sheet of the Institute which relate to the twelve months ended 30th September 1984.

In my opinion the attached accounts are properly drawn up so as to give a true and fair view of the state of affairs of the Institute.

The rules relating to the administration of the funds of the Institute have been observed.

All information required by me has been obtained.

Yours faithfully

P. O. REIS

AUSTRALIAN NAVAL INSTITUTE

FOR THE 12 MONTHS ENDING - 30 SEPTEMBER 1984

ACCUMULATED FUNDS	1984	1983
Balance at 1 October	20133.39	16187.62
Write off bad debts	103.00	
Adjust stock value	281.39	
Revised balance	19749.00	
ADD Surplus for year	2703.97	3945.77
	22452.97	20133.39
Provision for		
Replacement Medals	600.00	600.00
Legal Fees	200.00	100.00
LIABILITIES		
Subs in advance:		
1983/84		875.00
1984/85	5550.00	45.00
1985/86	120.00	105.00
1986/87	30.00	
1987/88	15.00	
1988/89	15.00	
Sundry Creditors	0.00	3213.30
	28982.97	25071.69

REPRESENTED BY

ASSETS	1984	1983
Sundry Debtors	6261.00	3334.00
Commonwealth Bonds	6000.00	15000.00
Savings Investment Account	0.00	3456.60
Cheque account	257.55	1668.96
Defence Credit Union	14465.59	0.00
Stock on hand:		
Insignia	1955.40	364.95
Medals	42.43	246.18
Medal Die	1.00	1.00
Seapower 84 Advance	0.00	1000.00
	28982.97	25071.69

FOR THE 12 MONTHS ENDING 30 SEPTEMBER 1984

JOURNAL OPERATING ACCOUNT

EXPENDITURE	1984	1983	INCOME	1984	1983
Printing Nov	4456.00	1887.00	Advertising:		5538.75
Printing Feb	3850.00	2602.00	Nov	2025.00	
Printing May	3850.00	2502.00	Feb	2880.00	
Printing Aug	4504.00	3052.00	May	2835.00	
Envelopes	342.40	0.00	Aug	2785.00	
Postage	677.27	470.00	Sales	435.48	123.50
Prizes	354.68	95.00	Subscriptions	1345.38	1047.00
Editorial expenses	149.98	61.88	(non-members) Net Operating		
Agent/Bank commission	105.40	0.00	Cost Transfer to Inc&Exp A/c	5983.87	3960.63
	18289.73	10669.88		18289.73	10669.88

INSIGNIA OPERATING ACCOUNT

Stock on hand 01 Oct	302.45	617.15	Sales	887.90	298.00
			Seapower 84		
Purchases	2651.54	0.00	gifts	116.25	0.00
Postage	33.55	0.00	Binders for		
Profit transfer			library	35.49	0.00
to Inc&exp A/c	107.50	45.80	Stock on hand 30 Sep	1955.40	364.95
	2995.04	662.95		2995.04	662.95

MEDAL OPERATING ACCOUNT

Stock on hand 01 Oct	127.29	292.81	Presentations	84.86	46.63
			Stock on hand		
Purchases	0.00	0.00	30 Sep	42.43	246.18
	127.29	292.81		127.29	292.81

SEAPOWER LINK ACCOUNT

Expenditure		Income	
1983 Advance	1000.00	Advance/repay	1000.00
Proceedings	6588.05	Advertising	6765.00
Distribution	186.43	Sales/P'dings	92.00
Report	47.00	Insignia	116.25
Speakers' gifts	116.25	Seminar	223.91
Hon memberships	195.00	(Surplus	
Profit transfer to Inc&Exp A/c	64.43	transferred)	
	8197.16		8197.16

FOR THE 12 MONTHS ENDING 30 SEPTEMBER 1984

INCOME AND EXPENDITURE ACCOUNT

EXPENDITURE	1984	1983
Journal Operating Costs	5983.87	3960.63
Postage	101.90	381.68
Audit Fees	160.00	130.00
Company Fees	4.00	2.00
Donation to Legacy	100.00	100.00
Advertising	94.12	29.88
Stationery	561.20	1003.61
Engraving	0.00	17.50
Library Additions	83.89	44.95
Bank Charges	59.37	63.39
Presentation Medals	84.86	46.63
Chapter Support	250.00	0.00
Provision for Replacement Medals	0.00	300.00
Provision for Legal Fees	100.00	100.00
Entertainment	0.00	42.37
Gifts	0.00	51.65
Secretary's Expenses	0.00	40.80
Guest Lecture	0.00	250.00
Office Services	429.33	0.00
Computer Service	475.00	0.00
	8487.54	6565.09
Surplus Transferred to to Accumulated Funds	2703.97	3945.77
	11191.51	10510.86

INCOME	1984	1983
Insignia Trading	107.50	45.80
Seapower 84	64.43	
Joining Fees	340.00	245.00
Subscriptions	8340.67	8399.88
Interest	2338.91	1820.18
	11191.51	10510.86

FROM THE TREASURER

The annual audit was carried out by Paul Reis and his report and supporting statements are published in this journal. There are a few points I would like to make in association with them, noting first that the statements are a direct output of our computer system. The accumulated funds have increased by $2300 after some adjustments for bad debts and stock value; the former were an accumulation of nonpayments for journals and proceedings several years ago, and the stock value was adjusted because of an incorrect write-off value assigned to the ANI Medal and because some insignia presentations had not been written off in previous years.

The good news is that the $600 provided for replacement medals will cover a firm quote we have from the Mint for 10 medals — $550. A very healthy sign is that we have received $5550 for subscription renewals, compared with a meagre $875 at the same time last year. In addition, another 100 members have paid since the end of the financial year — and the remainder will receive another gentle blue reminder slip!

The sundry debtors mostly represent advertisers in the August journal and Seapower 84 Proceedings. There are several of longer standing, despite numerous promises, and they are causing concern in our finely balanced economy. Members will note that we have joined the Defence Credit Union with the result that we get more interest and no charges.

Looking at the income and expenditure account, note that the income from subscriptions was less than our annual operating cost. Despite price increases, I hope our increased efficiency will contain next year's costs below those for this year; interest will be higher and less money will be spent chasing wayward members! The journal, quite rightly, consumes most of your subscription. Production costs rose dramatically and we compensated by adjusting our advertising rates after the November issue; some 40 or so Defence subscriptions are not currently paid for, so we hope for an increase in revenue when they are, or a drop in our costs when we delete them from the list. (Readers in ships and establishments — please check that your ship's subs are up to date, or this may be your last journal.)

After providing gifts for Seapower 84 speakers, and journal binders to the library at cost, the insignia account reflects a selling spree at Seapower, which itself showed a slight profit, attributable to generous support from our advertisers. You too can help to boost the funds by buying insignia, copies of Seapower 84 Proceedings or Seapower 84 Binders — soft blue vinyl cover with the ANI crest and the words 'Seapower Seminar, Canberra', pockets on the inside cover, and an A4 pad, $5 including postage in Australia. To aid the computer, please use your membership number when writing in relation to membership details (the number will appear on the address label in future).

Peter Coulson

SEAPOWER 84 PROCEEDINGS

The Proceedings of the SEAPOWER 84 Seminar have been distributed to all those who attended. Anyone wishing to purchase copies of the Proceedings should place an order, as soon as possible, using the format below. The cost of each copy is $12.00, which includes normal postage within Australia and surface mail overseas. Should despatch overseas by airmail be required, there will be an additional fee of $5.00 to cover postage.

Australian Naval Institute
PO Box 80
CAMPBELL ACT 2601

Please supply ..... (number) copies of the Proceedings of SEAPOWER 84 at a total cost of $....., being $12.00 per copy plus $..... for special postage.

NAME.....

ADDRESS..... (BLOCK LETTERS PLEASE)

.....

MARITIME MINING — AN AUSTRALIAN PERSPECTIVE

by Captain H.J. Donohue, RAN

The mine by its very nature tends in peacetime to fall within the province of the technician rather than the planner, and this tendency must be resisted if the weapon is to be developed on rational lines and used with effect when the time comes.

Captain J.S. Cowie, CBE, RN 1949[1]

While the mine warfare capability of most Western navies is at a low ebb, the Soviet Union has amassed a stockpile of about a quarter of a million mines — and well over three hundred minesweepers. Mines can be laid by most warships in the Voyennomorskoy Fleet or by long range attack aircraft.[2] This, and the increasing use of mines in recent years, demands that we reassess the relevance of this weapon in the Australian Defence Force and the threat it might pose to Australia.

Strategists generally agree that mining is a valuable capability to have in a Defence inventory, but very few naval officers actually come to grips with the concepts of minefield planning. Exercises involving mines are too often limited to the mere 'hatching of an area on a chart'.

However, Australia has recently re-acquired a mining capability, and it is therefore timely to discuss some of the issues relating to this newly-regained capability.

WORLD WAR II MINING

Navy Involvement

The use of mines by Australia is not new. In World War II, the Royal Australian Navy soon realised the need for defensive minefields, and requisitioned the coastal vessel *BUNGAREE* in October 1940. Commissioned in June 1941, *BUNGAREE* was a general-purpose cargo ship built in 1937 for the Adelaide Steamship Company; she was of some 3000 tons, and had a wartime complement of 175. She could make 11 knots, was equipped with two guns, and carried 423 mines. *BUNGAREE* was commanded by CMDR N.K. Calder OBE RAN (father of the recent Hydrographer), throughout the war.

During the period 1941-43, *BUNGAREE* laid 9284 mines, mainly in the Barrier Reef area, but also in New Zealand and New Guinea waters. As an aside, the mines were UK MK XIV Herz horn, moored mines, manufactured by Ford Manufacturing Company, Geelong. The company produced mines both for the RAN and the RN, and by 1942 had achieved an output of 5000 mines per year. *BUNGAREE*'s operations were conducted with a high degree of accuracy, as confirmed by post war minesweeping operations. The number of mines per field varied from 50 to 250.[3]

The planning of these minefields was done in Navy Office and *HMAS BUNGAREE* was given all details necessary to lay the field-position, charge weight, mine interval, depth and risk

The Author

Captain Hector Donohue joined the RAN as a Cadet Midshipman in 1955, graduating two years later. He sub-specialised as a Clearance Diving Officer in 1961 and as a Torpedo-Anti Submarine specialist in 1964.

After exchange service in the RN, including service in *HMS KIRKLISTON*, *HMS HARDY*, and as Long Course officer for the RN MCDO course, he returned to Australia. He served as Executive Officer of *HMAS SWAN* during her first commission, and after a short period as OIC RAN Diving School, returned to UK as Staff Weapons Officer to ANRUK. He completed the RN Staff Course in 1975 and commanded *HMAS YARRA* 1979-80.

His next appointment was Director of Underwater Weapons and since promotion to Captain in 1982, he has served as Director of Naval Plans. He completed a BA (Maths) in 1982.

factor. (From perusal of old records, the planning factor used was a 0.6 risk versus a target of 60 feet beam and 19 feet draft). A detailed report was forwarded by *BUNGAREE* after each operation and, consequently, comprehensive records are now held on every minefield laid.

As an ironic post script, *BUNGAREE* was decommissioned in 1946, sold overseas in 1957, and met her end in the Saigon River in 1966, when she sank after striking a mine.

RAAF Involvement

In April 1943, the RAAF was called upon to undertake a mining campaign in the Solomons and Bismarks. The RAAF received its general directive from the Allied Naval Commander, SW Pacific Area, through Commander, Fifth Air Force (General MacArthur's land-based air-force). Catalinas were chosen to conduct these operations because the only aircraft capable of carrying the necessary loads were heavy bombers fully employed in bombing missions. Catalinas were slow, but had a range of 1,000 miles with a 2000 lb mine load, or 750 nm with double that weight.

They proved so suitable in this role that an alternative aircraft was not considered. They were silent, very manoeuvrable and each aircraft typically carried about three-four UK A MK IV and/or US Mark 12-1 ground mines (77% magnetic, 18% acoustic and 5% magnetic acoustic).[4] They were also able to deploy with the advancing forces before airstrips were prepared. In addition, they often provided the only available reconnaissance of target areas, and therefore were regularly given specific reconnaissance missions to be carried out on completion of their mining operations.

For the first year of their operations, the part time services of two squadrons were available for mining; after April 1944, however, three Catalina squadrons were employed full time. In all, they laid 2498 mines in 50 different target areas. All mines were laid visually and drops were conducted at a height of less than 1000 feet and generally between 100 and 500 feet. The opposition encountered was usually moderate, and often there was no Japanese reaction at all — attributed to the quietness of the aircraft and low altitude. Only 11 aircraft were lost in a total of 1130 successful sorties, despite the difficult flying conditions.

Summary

Given the number of harbours suitable for mining in the Netherlands East Indies and South West Pacific, and the shortage of Japanese minesweeping capability, Australian minelaying operations achieved substantial results with economy of effort. Whilst a total of only 11 ships were sunk by mines, it has been assessed that to have done as much damage to the enemy's war supplies by bombing would have required the full time employment of 10 squadrons.

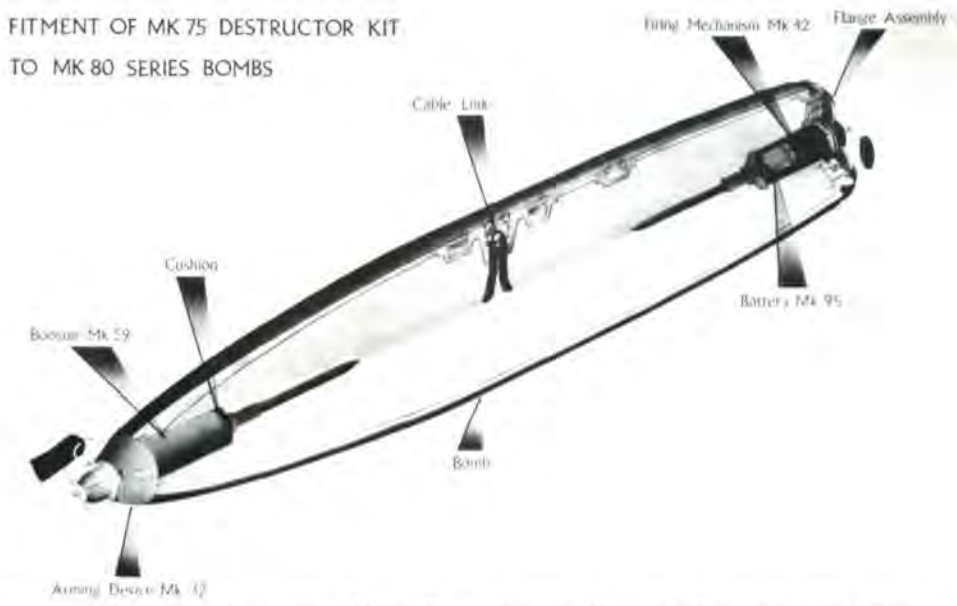
An example of the disruption caused by mining, is the total congestion in the two main ports of the Netherlands East Indies. Whilst the ports were closed pending sweeping operations, the exports needed by Japan, particularly oil, were cut off. Because of the mining threat, after February 1945, the Japanese abandoned the use of large ships in the area and used only small wooden vessels.[5]

USE OF MINES POST WORLD WAR II

Since World War II, we have seen an increasing use of mines, perhaps reflecting changing world attitudes. The most publicised examples of recent mining activity are summarised below.

Korea (1950-3). All mines used in Korea were from Soviet stockpiles and were deployed in mid 1950. About 4,000 moored and magnetic ground mines were provided, with about 3,000 of these being laid off Wonsan in a period of three weeks. After 15 days sweeping operations, 255 mines were swept or destroyed clearing a channel to the beach, with the loss of five sweepers. On the West coast, the mining of Chinnampo caused an ad hoc force to be assembled, which after some 32 days, cleared a 200 mile channel, destroying some 80 mines. In the period 1951-1953, substantial minesweeping operations were conducted along the Korean coast in anchorages, bombardment areas and channels, clearing some 700 mines without loss.[6]

India/Pakistan (1971). The Indo Pakistani war was significant because it was the first time since World War II that mines were laid in international waters. Both countries laid mines in the Bay of Bengal. The campaign started with the Bangladesh guerrillas (assisted by India) laying ground mines off the Pussan River just before the official outbreak of war. The minefield sank some three ships including two non-belligerent merchant ships, and virtually closed the port of Chalna. The Pakistani submarine *GHAZI* was probably sunk by own mines off Visakhapatnam the night war was declared. The Pakistan Navy also laid 'protective' moored mines off Chittagong. It is of interest that the mining attracted little international attention or condemnation. Subsequent clearing operations were conducted by India and USSR.[7]



Fitment of MK75 Destructor Kit to MK80 Series Bombs. Note: the Destructor Kit (forerunner of the US Quickstrike) produced by Australia which replaces the normal bomb safety, arming and firing mechanism with a mine sensor (firing mechanism MK 42 and battery MK95).

Vietnam (1972). On 8 May 1972, US carrier aircraft commenced mining Haiphong harbour. The mining of North Vietnamese waters continued for the next eight months. Besides expanding and replenishing the Haiphong harbour fields, other significant North Vietnamese ports and coastal shipping routes were mined. In all, carrier aircraft laid about 11,000 mines. The mining was immediately effective. A few vessels departed Haiphong during the three-day grace period before the mines armed; but then no more ocean traffic entered or left the port for the next 300 days. The twenty seven ships in the harbour when the mining commenced remained there. The minefields laid against other ports and coastal waters were equally effective in stopping traffic.[8] The subsequent US sweeping operation was costed between double and twenty times that of the minelaying.[9 & 10]

Suez Canal (1973). The Egyptian Navy laid protective minefields in the approaches to Port Said and in the Strait of Global and Gulf of Suez prior to the October 1973 war. These minefields formed part of the defences of Port Said and were specifically designed to protect that port city against amphibious attack and invasion. The minefields may have dissuaded Israel from conducting naval operations in the area during the 1973 war. During the conflict, two oil tankers were damaged, one of which finally sank. Subsequently, US, UK and French forces co-operated in MCM operations.[11]

Iran/Iraq (1981-?). Whilst not the dominant feature of this war, mines have been used by one or either party and the damage to a number of ships has been attributed to mines. A general concern expressed by USA in a number of press articles is the fear that Iran may close off the Gulf by mining the Straits of Hormuz. [12]

Falklands (1982). After the Falklands were captured, the Argentine Navy laid a protective minefield off Port Stanley from a surface ship, using ex British moored contact mines. It was suspected that ground mines may have been laid in Falkland Sound, but although the Argentines had such mines they were not used. (One comment from an RN officer was that the ship carrying these mines was destroyed by gunfire). To counter this threat, the RN commissioned five commercial trawlers as minesweepers and subsequently deployed specialist MCM vessels to the area.[13]

Nicaragua (1984). Mines were laid (by the CIA?) in Nicaraguan ports in early 1984 during the continuing guerilla war in that country. Reports indicate that six Nicaraguan fishing boats and six ships from five other nations were damaged (no ship was sunk).[14] From the reported damage and countermeasures operations undertaken, the mines used were probably moored, or drifting, with a small explosive charge (about 20-30kg).

Suez Canal - Red Sea (1984). About 19 ships were damaged from mine explosions in the southern approaches to the Suez canal and

along the Red Sea in July/August 1984. Speculations that they may have been laid from a Libyan cargo ship the *GHAT*, which travelled through the Canal and Red Sea and back, taking much longer than usual over the round trip. Libya has denied involvement. The mines may have been moored and/or ground, and from the reported damage, were probably of small charge weight. This is perhaps the first use of mines by terrorists, not to close an area, but to disrupt shipping and to create uncertainty/fear. UK, US and French MCM forces were deployed to the area to conduct mine searching operations.[15 & 16]

MINING OPERATIONS TODAY

Mining is an abstract, statistical exercise; the threat posed by a minefield is calculated in a complex way using delivery errors, navigation accuracy, ship influences, mine actuation radius, damage width and the presence or otherwise of countermeasures activity. The result is a measure of the probability of risk to a transitting vessel. It is worth keeping in mind, however, that a safe transit by one ship does not guarantee safety to others as was well demonstrated in the Suez Canal/Red Sea area in July.

Minefields are categorised as protective, defensive or offensive, depending on their location and strategic purpose:

- *Protective* mining relates to minefields laid in waters under own or allied control, and aims to protect ports, harbours, anchorages, coasts and coastal routes.
- A *defensive* minefield is laid in international waters or international straits with the declared intention of controlling shipping in defence of sea communications.
- An *offensive* minefield is laid in enemy territorial waters or waters under enemy control.

In the World War II context, *HMAS BUNGAREE* laid protective fields in the Great Barrier Reef channels and off New Guinea, and the RAAF laid offensive fields in Japanese controlled waters. Analysis of past mining operations shows that mines are extremely cost-effective weapons, particularly when the cost of the continued effectiveness of a minefield is compared with the cost of a manned weapons platform maintained for the same task eg, blockade. When mines are laid covertly they are virtually undetectable except by specialist MCM forces. This fact, and their devastating effect, produces a psychological response to the use of mines that tends to increase their actual effectiveness. When added to the disproportionate cost of an MCM capability, this makes mining a potentially very effective deterrent.

Mining is distinguished from other maritime operations in that it frequently offers an opportunity to inflict severe damage (or penalty) on the enemy, while affording him little or no chance for short term retaliatory action. It is also significant that in all forms of warfare, with the exception of mining, a direct confrontation between forces, units or persons of the opposing sides is required; bombs destroy material and personnel near the target; ground forces must be met by opposing forces to be effective; naval blockade involves ultimately the meeting of naval and merchant ships, however peaceable. The mine on the other hand, even when deployed, is a completely passive weapon unless challenged by a target. No one is killed, nor is property destroyed by the laying of a minefield.

A minefield can therefore serve as a de-escalating factor, since it may separate forces who otherwise might make contact. Once mines are laid, the onus of escalation shifts to the opposing party, who must either ignore it, with potentially serious effects, or challenge it by conducting countermeasurers.

LEGAL ASPECTS

Mining operations are necessarily pre-planned and not a spontaneous defensive or offensive act. A decision to undertake mining would require Government sanction after due consideration of all political, legal and military factors.

The possession of a mining capability also carries with it the general obligation to be able to clear these mines. The Hague Convention No. VIII of 1907, article 5, notes that: 'At the close of war, the Contracting Powers undertake to do their utmost to remove the mines which they have laid, each Power removing its own mines'. (Great Britain ratified this convention on behalf of Australia in 1909). Of course, apart from the legal obligation, there may be operational reasons for ensuring that mines laid can be cleared; for example, to allow future Australian operations in the same area.

Nations that carry out mining operations have particular responsibilities under international law particularly with regard to the safety of vessels and crews of neutral shipping. These responsibilities apply also to other forms of warfare that might be exercised at sea, but they are particularly pertinent to mining because of the non-discriminatory nature of the mine: once laid, the mine threatens the safety of any vessel which fulfills its selectivity requirements and approaches within its actuation radius.

A helicopter mine countermeasure squadron twelve HM-12, RH-53D Sea Stallion helicopter tows a Mark 105 magnetic minesweeping sled in the Suez Canal north of Ismailia, Egypt. The helicopter is taking part in operation Nimbus Star/Moon to clear the Canal of mines.

Courtesy: Official USN Photo

The following legal conventions bear on the right of a state to undertake mining operations, and the procedures to be followed if such operations are to be lawful:

Hague Convention No. VIII of 1907; The Law of the Sea, (particularly the Geneva Conventions of 1958 on the Territorial Sea and the Contiguous Zone and The High Seas), as affected by new norms of customary law which have emerged during UNCLOS III; the Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations (GA Res 2625 (XXV) of 24 October, 1970); the Definition of Aggression (GA Res 3314 (XXIX) of 14 December, 1974); and the UN Charter itself.

For those interested in mining,and for those with a legal bent, hours of interesting reading are guaranteed. For the majority, however, the key issues can be summarised as:

- *Protective Mining*. The mining of territorial seas for the protection of a coastal state may be undertaken by a neutral state which has reason to believe that other states, engaged in an armed conflict may violate those waters, and also may be undertaken by a coastal state entitled, under international law to exercise its right of self-defence in the face of an actual or imminent attack.
- *Offensive Mining*. A state will only be able to justify offensive mining operations as an exercise of its own right of self-defence under Article 51 of the UN Charter in special circumstances. Offensive mining must be a necessary and proportional response to the force used or the harm threatened against a state by a military opponent if it is to be justified on this ground.
- *Defensive Mining*. The practice of states since World War II shows a tendency to confine armed conflict to the belligerent's territory and the areas of water immediately adjacent. This is reflected in Article 88 of the new Law of the Sea Convention, which reserves the high seas for peaceful purposes. A pragmatic view is that defensive mining for a country like Australia, is unlikely to be a politically viable option.

STRATEGIC CONSIDERATIONS

Given the increased use of mines in recent years and the ease with which they could be acquired by terrorists, the possibility of their use against us, even in so called 'lower level contingencies' can no longer be discounted.

How then should Australia respond?

Australian defence policy emphasises the development of an independent and, within the limitations imposed by resource constraints, an increasingly self reliant defence capability.[17] Whilst the ANZUS alliance remains fundamental to our national security, it is appreciated that Australia must look primarily to its own defence capabilities to protect itself from a range of situations, particularly in our own region.[18]

The capability for mining already exists in the region and, as the review of mining since World War II has shown, mines can be acquired quickly and deployed — to varying levels of effectiveness — by countries with little background knowledge or experience.

In situations where military attack on coastal areas is likely, there could be a requirement for protective mining of ports, harbours or a given coastal area. There are few international legal constraints to the use of mines in this way and hence protective mining, if seen as a military requirement, is a politically sound option even in a lower contingency situation. Moreover, given the larger number of commitments Australia's maritime forces would expect to have to meet in any contingency, the appropriate forces may not be available to guarantee a sufficient level of protection to some key ports/coastal areas. Protective mining may be the only option in these circumstances.

On the other hand, defensive mining, or mining in international waters, requires expensive, high technology mines to be effective. Apart from the cost of such weapons, the practical aspects of conducting a worthwhile defensive mining campaign, together with the legal and political implications, preclude defensive mining as a viable option for a country like Australia.

Higher contingency operations are assessed to be improbable in the short term, and Australia's strategy is to strengthen our defence forces only after an assessment that the strategic circumstances were deteriorating. However, it is a matter for judgement whether the concept of warning time, upon which this strategy is based, is a valid way to rationalise limited defence spending, even given our currently favourable strategic circumstances, and the enormous pressure for government spending in other areas.

One of the major problems with the notion of warning time is that, despite our best intentions, intelligence may not be interpreted correctly;

history has demonstrated that new intelligence information tends to be weighed against existing views. And, particularly under conditions of uncertainty, organisations tend to reject new information in favour of their existing beliefs and pre-conceived ideas.

Operations in a low level contingency would aim to deter or counter with a controlled response, any hostile action against Australia. If Defence force involvement was required, the Government's directive would almost certainly be to de-escalate while, at the same time, enforcing our lawful rights. It is unlikely that offensive mining would be conducted, although the capability to undertake such operations could serve as a useful tool in any negotiations.

Additionally, whilst the distinction between low and high level contingencies is easily articulated and is perhaps a convenient way of postulating situations to consider the relative merits of various force structure options, events in recent years have demonstrated that the distinction between a lower level contingency and higher levels is not, in practice, so clearly defined. Consequently, a low level contingency could change, in a very short time, to a high level contingency, and the force-in-being could well be required to react without the luxury of the postulated build-up.

Given a deterioration in our strategic situation, and without the time to build up and train our forces, the mine becomes an important weapon. it can be used as a deterrent to escalation and, ultimately, it could be valuable as a force multiplier. Ships kept in port, or deterred from entering port becasue of a mine threat, cannot contribute to the enemy war effort. In the short term, the cost to the enemy may be the equivalent of actually sinking them. Hence the ability to undertake offensive mining operations in a high level contingency could be very important to Australia's long term security.

CONCLUSIONS

The minefield is a unique weapon in that it can pose a threat without any other forces being present. It can be used to enforce a blockade without risking forces and it is a most effective means of stopping neutral shipping from entering or leaving an enemy's port. A minefield can effectively deny free movement to enemy surface and submarine forces, and the threat of mining will require a potential enemy to divert resources into defensive mine countermeasures capabilities.

Mining operations, whether overtly or covertly, can have a profound psychological and political impact on an aggressor. Mines can be employed to avoid face to face confrontation, and can act as a de-escalating factor by separating forces. Mining is ideal for use in support of other operations, providing planners with a force multiplier for other conventional capabilities.

The legal constraints on mine warfare include, but go beyond the Hague Convention. Emphasis is placed on the safety of neutral shipping and on the right of self defence. The rules of international law are most likely to prevail in any regional conflict where the major powers remain neutral and where the military situation has not become desperate. Careful consideration of the international legal implications involved in a proposed mining action is required if subsequent actions are to be identifiable with approved international procedures.

Mining is an option only where an act of aggression occurs against Australia or an ally with whom we have a collective self defence interest. In this context, aggression can imply the imminence of such an act, but this must be able to be proved. Mining can only be undertaken legitimately as an act of self defence although, in a practical sense, this can include offensive mining to prevent an enemy from launching an armed attack. Protective mining is legal, given an imminent armed attack against Australia. Defensive mining is not considered to be a practicable option for a country like Australia.

In summary, mining is very relevant to Australia's strategic circumstances and is a weapon that should be stockpiled for use in possible offensive or protective mining operations. The ability to undertake a credible mining campaign is even more relevant if the notion of warning time is questioned.

However, the acquisition of such weapons doest not constitute a viable mining capability. Given adequate scientific, technical and logistic support, minefield planning skills need to be improved and minefields should be included in major exercises as a matter of course — not as a hatched area on a chart, but as a detailed minelay, with the various commanders exposed to the risk calculations and the problems of allocating realistic resources. In addition, higher planning staffs should be well acquainted with the necessary procedures to seek political approval for such a campaign, and the international legal arguments, which are not as constraining as may be popularly thought.

Finally, those force elements with a mining role need to regularly practice the skills necessary to lay an accurate minefield in a variety of environmental conditions.

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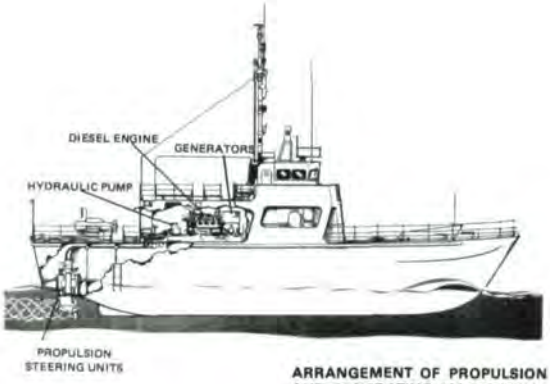


ARRANGEMENT OF PROPULSION AND GENERATING MACHINERY

WEAPON SYSTEM ARRANGEMENT

Courtesy: RFA

THE RAN INSHORE MINEHUNTER PROJECT

by Captain P.G.V. Dechaineux AM RAN

Most maritime nations are concerned with the threat of mine warfare. A mining campaign can be carried out quite covertly and by relatively untrained personnel using unsophisticated laying vessels. Such a campaign can paralyse or severely disrupt a nation's seaborne trade. The use of mines can be relatively cheap, but they are difficult and expensive to counter. Mines do not even have to be laid to be effective. Just saying that a minefield has been laid can achieve the aim.

About 98% of Australia's imports and exports are transported by sea, and much of Australia's defence capability depends upon safe passage through sea lanes and port entrances. Australia's coastline is such that all significant ports or port entrances are able to be mined.

One of the classic examples of the use of sea mines was 'Operation Starvation' carried out by the USA in World War II against Japan. During the campaign, about 25,000 offensive mines were laid in Japan's shipping routes and harbours. As a result, over 1000 enemy ships were sunk or damaged, and the campaign caused the virtual collapse of Japan's seaborne transportation and heavy industry.

A more recent example of the effectiveness of the sea mine was its use by the USA in Haiphong in 1972. The effect of the mining campaign was to paralyse sea traffic to and from the port, and a direct result was the negotiation of the early release of American Servicemen held as prisoners of war by the North Vietnamese. Mines were also used in the Falkland Islands conflict (1982) and in Nicaragua (1984). At the time of writing, there is strong evidence that mines have been laid in the Red Sea and 16 ships have so far been damaged.

Navy's present wooden hulled *TON* Class minehunter *HMAS CURLEW* was built in the United Kingdom in the 1950s and purchased with 5 other *TON* Class vessels from the Royal Navy in the 1960s, all the ships then being configured as minesweepers. Subsequently, in the late 60s, two were converted to a minehunting role. The valiant efforts of operators and maintainers have kept *CURLEW* going, but she is approaching her end of life and her capability falls short of today's requirements of the Australian Defence Force.

The Navy's new minehunting capability will be provided by an Australian designed and built, glass reinforced plastic (GRP) minehunter catamaran. This vessel introduces new concepts and technology into the Royal Australian Navy and the involvement of Australian industry in this innovative and exciting project is significant.

THE MINEHUNTER PROJECT

Project Background

Navy raised the requirement to replace the *TON* Class minehunters in 1974. Several options were proposed, including overseas designs, and in 1975 the GRP minehunter catamaran was chosen as the preferred option on the basis that it provided the required capability at least cost.

The project is divided into three phases:

- Phase 1 - Project Definition
- Phase 2 - Prototype Construction and Evaluation
- Phase 3 - Construction of Production Vessels and Provision of Support Equipment.

Phase One

Approval was given to proceed with Phase 1 in 1975. The major elements of Phase 1 included definition studies for the minehunting weapon system, costed studies for GRP construction, construction of scale models, materials testing, tank tests and initial magnetic modelling. The current cost of this phase is $1·5m.

An extensive series of tests has been undertaken to prove the hull construction concept. Many of the tests have been related to shock. The culmination of the underwater shock test programme was the testing of a full scale

hull section in December 1980. The section was subjected to 13 underwater explosions of increasing intensity. The tests proved that the GRP hull was satisfactory and in fact allowed a slight design reduction of hull strength in certain areas.

In 1978, two sonar manufacturing firms were contracted to provide definition studies for the minehunting weapon system. Because of the specialized requirement of the minehunter, including a modularized and containerized weapon system, it was not possible to buy a complete system 'off the shelf'. System components had to be arranged in a format suitable for the catamaran hull concept and significant design work was involved in integrating the various sonar, navigation, and tactical data inputs. Selection of the weapon system was made after exhaustive evaluation, and in 1981 a contract was let with Krupp Atlas Elektronik of the Federal Republic of Germany for a high definition sonar utilizing a small circular array transducer and advanced digital data processing techniques. In 1983, a contract was let with Societe ECA of France for the ECA 38 Mine Disposal System. This system uses the PAP 104 mine disposal vehicle for placing an explosive charge next to the mine to be destroyed.

Phase Two

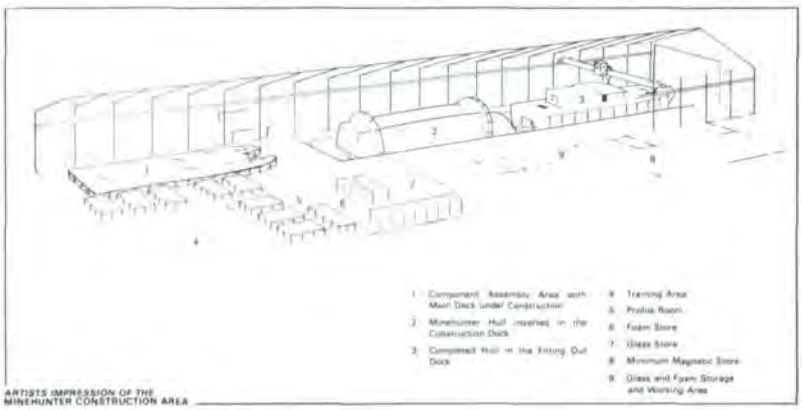
Phase 2 was approved in 1976 and includes the construction of a Land Based Magnetic Test Range at Kingswood NSW, the construction of two prototype vessels, and their subsequent Trial and Evaluation. The current cost of this phase is $87.9m.

Under Phase 2, three sets of long lead equipment items are being purchased. Two sets will be fitted in the prototypes and the third set will be held as spare for use during the Trial and Evaluation period and will be used for fitting in the first production vessel if Phase 3 is approved.

The two prototype vessels are being constructed by Ramsay Fibreglass Australasia, a division of Carrington Slipways of Tomago NSW. The contract was signed in January 1983. Prior to the contract, no Australian shipbuilder had the necessary facilities to construct the vessels to the standards required and therefore the initial stage of the shipbuilding contract entailed the construction of a specialized facility which has extensive environmental control equipment to maintain temperature and humidity within the exacting limits required for high strength GRP.

The equipment for the vessels is far from ordinary. They must have high shock resistance and the magnetic, pressure and acoustic signatures of the vessel must be as low as possible. This means that, in general, ferrous metals cannot be used, conventional electric motors are not acceptable, all materials must have low magnetic permeability, the vessel displacement must be as small as possible, and all equipment and systems must be designed for minimum noise. The cost of producing such equipment is most significant; a price of ten times that for conventional equipment is not uncommon.

The Land Based Magnetic Test Range is also a specialized requirement. Every item of equipment and stores carried on board the vessels must be magnetically checked prior to embarkation. Every time an equipment is removed for repair it must be re-ranged to check that no magnetic contamination has occurred. The range itself consists of a track, over 100 metres in length, on which runs a trolley for carrying the item to be ranged. At the centre of the track is a sensor shed which contains



Artists impression of the minehunter construction area.

Courtesy: RFA

HMAS RUSHCUTTER (MHI 01). Inverted hull prior to fibreglassing.

Courtesy: DPR

magnetometers for sensing the magnetic signature of the item and field coils for negating the effect of the earth's magnetic field. The field coils can also be used to simulate differing ambient earth fields.

The prototype vessels will each take about two years to construct after completion of the shipbuilding facility. Following construction, an extensive series of trials will be undertaken to prove the technical and operational aspects of the vessels prior to the decision to proceed with follow-on production vessels.

Phase Three

Phase 3 has not yet been approved and is dependent upon the successful evaluation of the prototypes. The number of ships to be built under Phase 3 has not yet been finalized, but four are being planned at this stage.

Phase 3 will also provide the full range of support services needed for this new class of minehunters.

VESSEL CHARACTERISTICS AND DESIGN

The catamaran design was selected because it provided a stable deck with a large working area for the ship's size, the manoeuvrability is better than a mono hull due to separation of the propulsors, and heavy items of machinery can be placed high in the ship thus reducing magnetic and acoustic signatures when measured at a specified distance below the water surface. The method of construction of the hull is based upon the use of a composite foam sandwich which precludes the necessity for a costly hull mould. The sandwich consists of a layer of 60mm thick high density rigid PVC foam with 8mm inner and outer skins of seven layers of alternating plys of glass woven rovings and chopped strand mat.

The approximate principal characteristics of the minehunter are:

Length overall	31.0m
Beam (Max)	9.0m
Beam (each hull)	3.0m
Draught	2.0m
Displacement (Full Load)	180 tonnes
Speed	At least 10 knots
Accommodation	14

Weapons System

The minehunting weapons system consists of four sub-systems ie, Sonar, Precision Navigation, Tactical Data and Mine Disposal. Data from the sonar sub-system is fed to the tactical data sub-system where it is integrated with data from the precision navigation equipment to determine the accurate geographic location of mines. The information is presented on tactical display screens and can be stored for later analysis. The sonar sub-system is

contained within a module located forward in the port hull. The tactical data sub-system and data processing and display units are within an operations room container situated on No. 01 deck just abaft the bridge. Two mine disposal vehicles are situated aft on No. 1 deck. Control of the vehicles is exercised from the operations room container. The modules, containers and weapons are easily removable allowing rapid replacement.

Destruction of mines is achieved by using a PAP 104 mine disposal vehicle which can be loaded with an explosive charge from magazines underneath. The loaded vehicle is lowered into the water by crane and wire guided to the position of the suspected mine. Final mine classification can be made by the use of a TV camera situated in the vehicle and a TV monitor in the operations room container. The charge is dropped in close proximity to the mine; the vehicle is guided back to the ship, and then the charge is detonated from a safe distance.

Propulsion System

The propulsion system consists of two high speed diesel engines (approx 200 KW each) each driving an electric generator at the forward end and an hydraulic pump at the aft end. The generators provide ship's power and the hydraulic pumps operate two propulsion steering units, one in each hull. The propulsion steering units use a 'puller' propeller rather than the conventional 'pusher' type and the thrust can be vectored through 360°. They can be removed from the hulls through openings in No. 1 deck without the need to dock the ship.

Accommodation and Victualling

Accommodation for 14 men will be provided. The accommodation spaces are situated below No. 1 deck whilst all operating stations are on No. 1 deck and above. This arrangement provides crew safety since no personnel will be inside either of the hulls when operating in a minehunting mode.

Food preparation in a conventional ship requires normal galley equipment all of which adds to the weight and magnetic signature. The minehunter catamaran will employ pre-packaged and frozen airline type meals with a small microwave oven.

VESSEL CONSTRUCTION

The hull construction method employs an inverted wood frame male mould on which the hull shape is built up of foam slabs which are butt jointed and glued. After fairing the foam, the outer skin is laminated, the hull and mould turned over, the mould removed and the inner-skin is then laminated. Bulkheads and decks are prefabricated and then bonded into position.

Magnetics

Magnetics play a vital part in mining and mine countermeasures. The sensitivity of modern magnetic mines is such that every possible precaution must be taken to minimize the magnetic signature of the ship. These precautions start at the design stage and continue through the ship construction stage and operational life of the ship.

One of the fundamental precautions is the virtual prohibition of conventional ferrous construction material. The cost penalty is obviously significant. The alternatives to conventional ferrous materials are minimum magnetic stainless steels (little knowledge of which is held in Australia) and non-ferrous metals and materials. In this regard, Defence will be looking to industry to provide minimum magnetic equipments and materials and know-how in non-ferrous materials. Defence experience to date is that Australian industry does not have a good comprehension of the specialized magnetic requirements of mine countermeasures vessels.

Electromagnetic Interference

GRP structures are transparent to electromagnetic radiations. These radiations can cause unacceptable effects which are extremely difficult to predict and often difficult and costly to rectify. For example, certain radio transmissions could trigger off an unrelated control circuit or a spurious signal could be generated in a control cable on one side of a bulkhead on the other side of which is a power cable. The designers and constructors must be aware of this phenomenon and allow physical separation or radio frequency shielding.

Earthing and Bonding

As GRP is non-conductive, an electric earthing system has to be provided to earth all metallic equipment.

Extreme care has be taken to prevent any large conductive loops. Any such loops will generate eddy currents when the ship rolls in the earth's magnetic field. These eddy currents set up their own magnetic fields which can prove unacceptable in terms of the ship's signature. The effect that this requirement has on cabling systems and piping systems is dramatic. For example, before any pipe is connected, the mating parts must be checked to ensure that the connection will not form a loop. If it does, then insulation must be inserted at some point in the loop.

PROTOTYPE TRIALS AND EVALUATION

The first prototype is expected to complete building in 1985, after which an extensive series of trials will be conducted. The types of trials envisaged are:

- Speed trials
- Endurance trials
- Ship motion trials
- Structural evaluation trials
- Manoeuvrability trials
- Station keeping trials
- Underwater shock trials
- Airborne noise measurements
- Underwater noise and magnetic measurements.
- Assessment of electrical performance
- Vibration trials
- Weaons systems tests and trials
- Communications trials
- Radiation pattern trials
- Electromagentic interference trials
- Precision navigation trials
- Docking demonstration

The objective of these trials is to validate the designers' predictions and prove the performance of ship systems. Following their successful completion, a decision may be made to build further production vessels.

The Forward Support Unit

A deployed mine countermeasure force must be provided with support close to the scene of operations. The minehunters will not be complemented or stored for self support, and therefore a mobile support unit has to be provided which is capable of rapid deployment and with a support infrastructure able to cope with normal support problems encountered in the field.

The mobile support requirement will be met by a Forward Support Unit (FSU) which will provide a level of maintenance equivalent to that inherent in the technical complement of a conventional ship.

The FSU uses standard size ISO containers and is transportable by road, rail, air or sea. The FSU may involve up to about 16 container modules including: electronics workshop/fitting shop; office/library; stores office/special stores

Attaching rigid PVC foam to the inner hull surfaces of the inverted male mould.

Courtesy: DPR

stowage modules; minimum magnetic stores modules; communications; command and control; and power generation.

The Land Based Magnetic Test Range

The Land Based Magnetic Test Range (LBMTR) is an essential element of support. The magnetic signature information obtained is used to:

- develop a mathematical magnetic model of the vessel,
- provide information for physical magnetic modelling,
- determine compensation requirements for individual items, and
- certify an item as acceptable for use in mine countermeasures vessels.

Minmag Stores

Once an item of equipment has been certified as magnetically acceptable at the LBMTR, the item must be stored, handled, packaged and labelled in such a way that it is delivered to the ship with no change to its magnetic signature.

Conventional stowage areas and mechanical handling equipments are unsuitable for MCM equipment and spares holdings. Special minimum magnetic stores will be provided as part of the minehunter project.

CONCLUSION

Production of the GRP minehunter catamaran is a complex project involving several interrelated major activities such as the land based magnetic test range and the shipbuilding facility. The design of the vessel is not only novel, it has to meet very stringent magnetic and acoustic requirements. Successful evaluation of the prototype vessels will prove the design concept and should lead to follow-on production of the only type of this vessel in the world. Not only will Australia have an improved minehunting capability, but also local industry will be developed and an in-country capability for producing the highest quality GRP vessels will have been established.

A Civil War "Keg Mine". Once an old beer keg, a load of explosives made it a deadly weapon. The Confederates laid hundreds of such mines at Charleston.

Courtesy: Photo supplied by Captain Donohue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MINE WARFARE — HISTORY AND DEVELOPMENT

by Lieutenant Commander R.H. Crane, MCD RAN

Mine warfare, quite possibly one of the most underrated methods of weapon delivery and actuation, is once more, and deservedly so, on the move again. The Royal Australian Navy has a sound background in this less glamorous type of warfare and is now devoting considerably more time and expense in upgrading and developing its forces in line with a current world wide renewed interest. In short, it is now obvious, as it has been in the past, that to safely move our naval and merchant ships around the Australian coastline, our mine countermeasures must be both technologically advanced and highly professional to counter what is often incorrectly referred to as a simple and easily countered threat.

THE FIRST MINES

What Is It?

At the risk of boring some of the more Mine Countermeasures (MCM) orientated readers, it is useful to recap on what a mine is. The mine is any explosive device which is laid in the water with the intention of sinking or damaging ships or of deterring ships from entering an area. It is unique in all weapons today in that, with few exceptions, it waits for the target to approach rather than approaching the target itself. It also enables the delivery platform to be well away from the immediate area of operations.

Mines are classified in two ways. The first is by construction: a moored mine is a buoyant case held underwater by a sinker on the end of a mooring wire; alternatively, a mine case may be packed full of explosive and lie on the seabed as a ground mine. The ground mine is primarily a shallow water weapon whereas the moored mine may be used in a wide range of depths.

The second type of classification is by the means which causes the mine to fire or the actuation system. The oldest and more widely known method is by contact between the hull and the case of the mine body. This method is almost exclusively used in moored mines. The other widely used method is influence, of which there are three main types. The first is magnetic, which is caused by the distortion of the earth's magnetic field due to the presence of ferrous material in the ship or its equipment; next, radiated noise from the ship due to machinery or propeller rotation; finally there is pressure, or more accurately suction, which is caused by the pressure and suction waves produced by a ship moving through the water. Magnetic and acoustic influences are used in both ground and moored mines, whilst pressure is reserved exclusively to ground mines. The last method is called controlled actuation. Essentially this is where a cable from the mine, either moored or ground, is led ashore to where the mine can be switched on or off or even detonated by command signal.

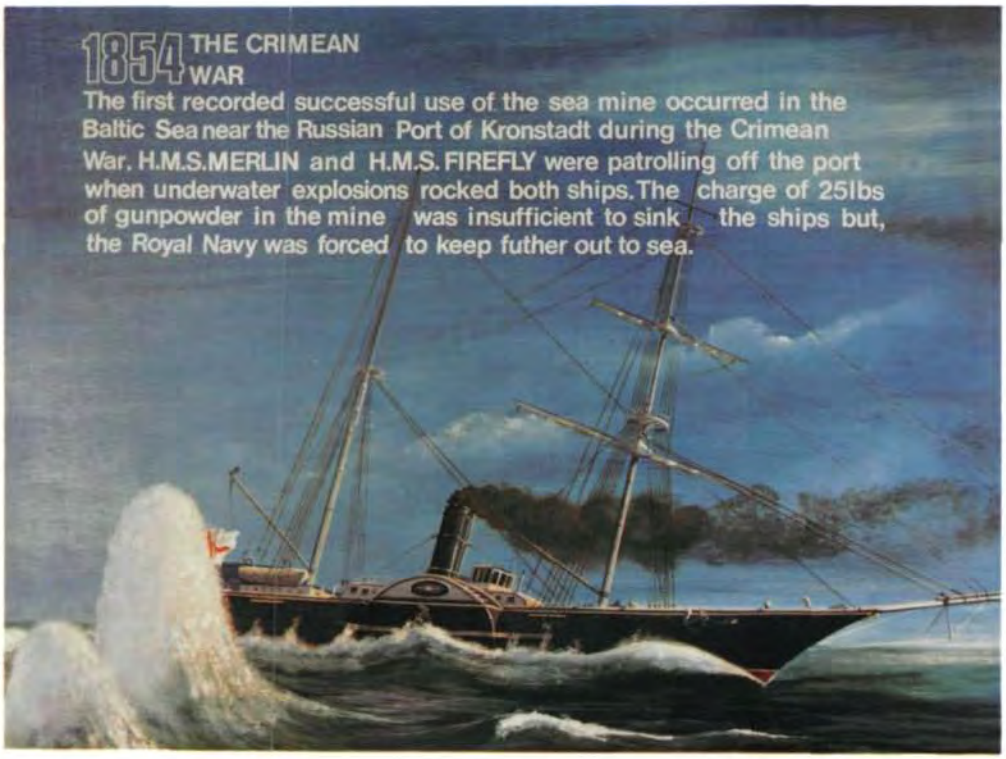
Additionally, mining is defined dependent upon the use it is put to. Of these, Offensive Mining, placing mines in enemy territorial waters or waters under the control of the enemy, is potentially the most effective mine warfare mission. Defensive Mining is the mining of international waters and choke points not controlled by either belligerent. It can capitalize on a country's strategic disadvantage of geography. One important point is that a mine laid in international waters which is not declared is considered to be an offensive act by the perpetrator. Lastly, there is Protective Mining which is the mining of friendly territorial waters to protect ports, harbours, anchorages and coastal shipping routes. Protective mining would cause an enemy grave concern when attempting to enter our waters to interdict shipping or mine our ports.

Bushnell's Kegs (1777)

The very first examples of a mine, Bushnell's Kegs, violate the definition as they did not lie in wait but were supposed to drift slowly down the river at Philadelphia and explode against some British ships that were anchored there in the year 1777. General Washington authorized Bushnell to attempt the destruction of the British vessels using his newly invented sea mine. The mine consisted of a charge of powder in a keg which was supported a few feet below the surface by a float on the surface. In the keg there was assembled with the powder a gun lock, so adjusted that a light shock would release the hammer and fire the powder. It turned out that none of these mines contacted or damaged any British ships. The mines were released about Christmas Day 1777; however, they did not reach the target area until January 5, 1778 because of the ice in the river. Because of the ice, the British ships had been brought in close to shore, so the mines bypassed them. Although unsuccessful, these weapons were definitely contact drifting mines and

The Author

LCDR R.H. Crane MCD, RAN was born in Southport, Queensland and joined the RAN in 1970 as a Junior Recruit. After gaining his commission in 1972, he completed the Mine Warfare and Clearance Diving Course in 1977 and was posted to the UK as a Mine Warfare Instructor at *HMS VERNON* in 1981-82. He returned to Australia in 1983 and after a short time in the Clearance Diving School, *HMAS PENGUIN*, was posted as Commanding Officer, *HMAS CURLEW* where he is currently serving.



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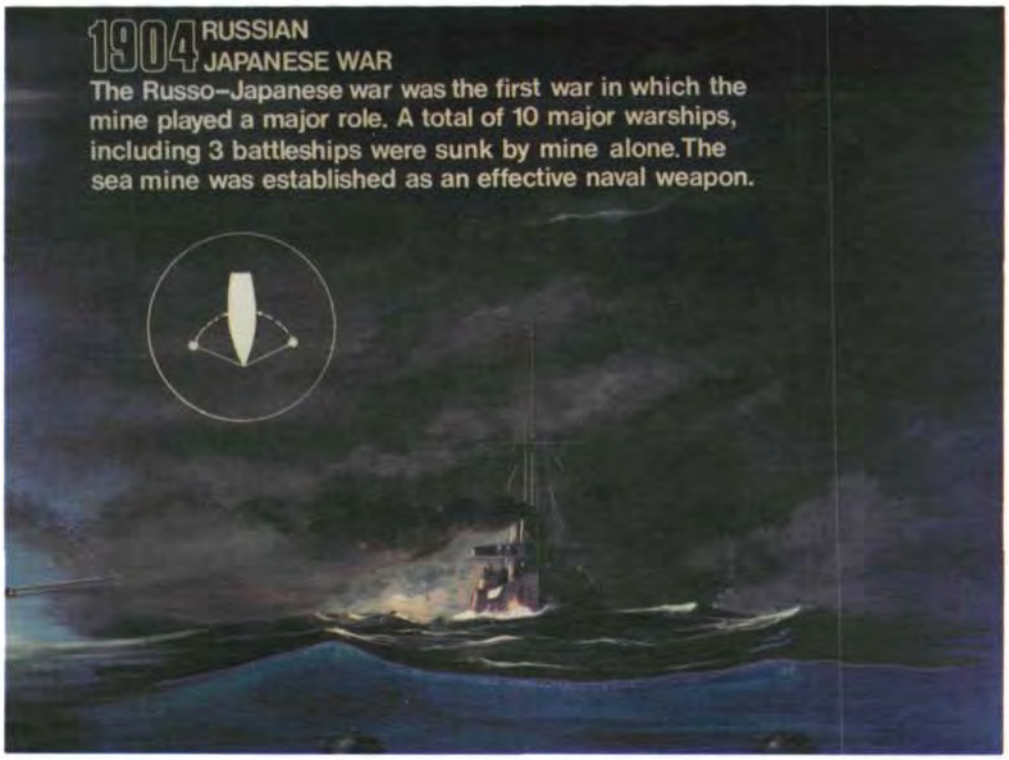

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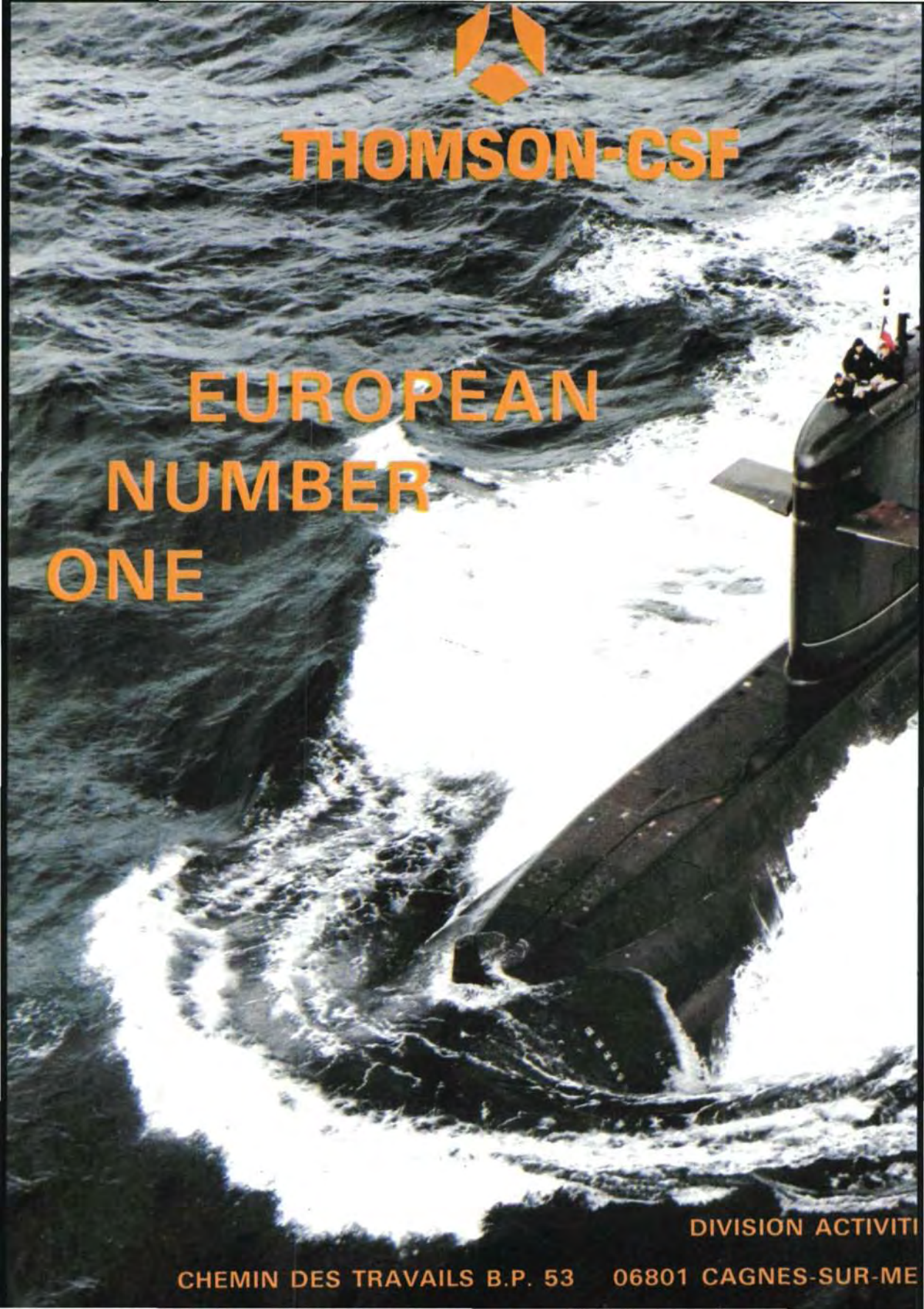
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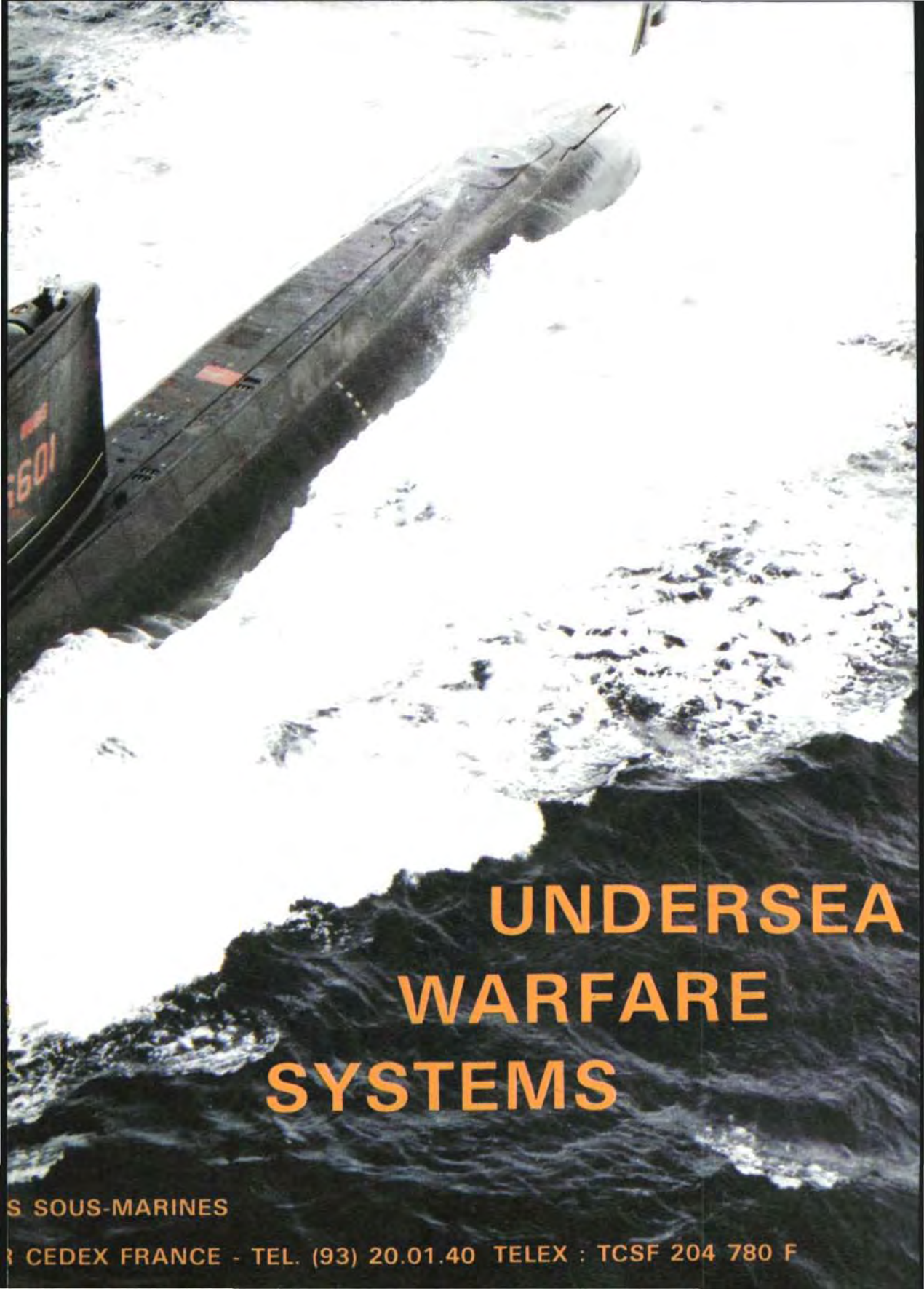

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used the underwater explosion long before the invention of high explosives, and a contact mechanism for initiation. They were the first mines used in a long history of warfare.

Fulton's Mine (1810)

Robert Fulton was the next famous name to play a role in the development of mine warfare. Fulton was involved in various experiments during and after the war, until in 1810 he produced a design of a moored contact mine. The mine was very simple, a copper chamber filled with 100 lbs of gunpowder; a flint lock firing system was cocked and fired by contact on the whiskers. The mine was held at its correct depth by a pre cut mooring rope attached to a heavy sinker.

During his experiments prior to 1810, he had offered his services to both the French and English Governments. The French turned him down on the grounds of the weapon being morally indefensible. The British Prime Minister, Pitt, however, was very attracted to the idea and appointed a committee to investigate the idea. The First Sea Lord, Lord St Vincent, saw things differently and declared 'Pitt was the greatest fool that ever existed to encourage a mode of warfare which those who commanded the sea did not want and which if successful would deprive them of it'. The committee evidently agreed with St Vincent and Fulton packed his bags.

Colt's Mine (1843)

Yet another American, Colonel Sam Colt, appeared on the scene when in 1843 he developed a mine to be used in defence of harbours. This mine was different in that it was not fired by the ship touching it, rather by electric command signal from ashore. Colt proceeded to carry out live demonstrations of his mine and in an experiment witnessed by President Taylor and members of Congress he sank a ship in the River Potomac near Washington. The fact that one of his trials vessels sank in the navigation channel and caused an extensive sandbar to develop may have influenced Congress and they were dissuaded from supplying more money. Colt returned to the more luctrative field of small arms.

Crimean War 1854

Colt's experiments had been keenly observed by a number of European nations. Imperial Russia was one of these countries which started a mine development programme. The result was a small moored contact mine with a revolutionary firing system. The horns which projected from the spherical case were the development of two chemists, Professor Jacobi and a Swede, Mr M. Nobel, father of Alfred.

The lead horns contained a packed mixture of potassium chlorate and sugar, surrounding a glass phial containing concentrated sulphuric acid. When the horn was struck by a ship, it bent, breaking the glass phial. The two mixtures have the property of reacting to generate spontaneous ignition, thus setting off the main charge of 25 lbs of gunpowder. This type of horn was the forerunner of a series of chemical horns and was known as the Jacobi horn.

The mine was used by the Russians during the Crimean War to defend the port of Kronstadt against the close blockade by the Royal Navy. HM Ships *MERLIN* and *FIREFLY* steamed into a field of these mines and both ships sustained damage, but survived due solely to the small charge weight of these mines. The Russians were very encouraged by the results and have continued a mine development programme with great energy up to the present time.

American Civil War 1861

The scene now moved back to America. The Civil War found the Confederate States on the defensive at sea due to the superiority of the Union Navy. The experiments of Colt and the example of the Crimean War led the Confederate Navy to employ the mine for defence. The Union lost 23 ships sunk, the Confederacy two.

The Confederate mining was concentrated as a defence for ports and rivers. During the attack on Mobile, Alabama, Admiral Farragut's remark: "Damn the torpedoes, full speed ahead" was made following the sinking of the *USS TECUMSEH* with all hands after striking a mine.

This brute force method of dealing with mines was obviously unsatisfactory when peace came, and therefore the Union Navy developed a sweep to clear the Confederate mines. The sweep consisted of a heavy chain towed along the bottom between two shallow draught steam boats. Mines were snagged by the chain and dragged into shallow water where they were destroyed. This sweeping operation, though a hastily conceived and executed affair was a success. On completion of the operation, the minesweeping force was disbanded and all further mine warfare development ceased.

Development (1865 - 1904)

Following the American Civil War, there were a number of wars in both Europe and Asia in which mines were used. The prime use of the mine up to 1865 had been defensive; however, two developments were to change this. The first was the Hertz Horn. This horn was developed by Doctor Hertz of the German Mining Committee and was a considerable advance on the Jacob's Horn. When the glass phial was broken, the acid fell on plates forming an electric cell, and a potential of 1.8 volts was produced, sufficient to fire an electric detonator. This horn had the advantage of being simple to make, reliable and of almost indefinite life. This horn is still in use today.

The next development was British, in the development of the automatic depth taking sinker. A float with a set length of rope was attached to the mine. On laying, the float separated and stayed on the surface while the mine and sinker sank until the mine reached the desired depth, the sinker then continued to sink until it reached the bottom. The mine was now moored. The float then sank flooding through small holes. This development eliminated the need for careful survey, pre-cutting of mooring ropes and accurate laying of mines. These two developments resulted in the mine advancing from a defensive weapon to an offensive weapon to be laid in enemy waters.

THE DEVELOPING WEAPON

Russo — Japanese War (1904-05)

Early in the 20th century, the independent mine was to be given its first real test. Both countries of the

Russo-Japanese war possessed adequate stocks of mines as well as reasonably balanced fleets of modern ships. The Russians had two war bases at Vladivostok and Port Arthur. The fighting ashore was on the Korean Peninsula and the Japanese navy had to protect the sea communications between Japan and Korea to support the Japanese army. The Japanese instituted a close blockade of both Russian ports, particularly Port Arthur where the main Russian Force was based.

The Japanese Commander in Chief, Admiral Togo ordered a minefield to be laid under cover of darkness off Port Arthur. This minelay was observed and plotted, but not apparently transmitted to the Russian C in C, Admiral Makarov. Makarov was one of the foremost authorities of mine warfare of his day and would have immediately understood the offensive nature of this field.

The next morning, an inferior force of Japanese ships closed the port and lured the Russian battle squadron to sea. The entire Japanese battle fleet then came over the horizon and the outnumbered Russians retired, over the Japanese minefield. The flagship *PETROPAVLOVSR* was lost with the Admiral, and the other Russian battleship *POBIEDA* was seriously damaged.

Admiral Makarov was, however, to be avenged. The Captain of the Russian minelayer *AMUR* appears to have been a free spirit as well as a student of Makarov. He carefully observed the movements of the Japanese blockading ships and on receiving orders to lay a small protective minefield exceeded these orders and laid his mines to his own plans. Within 12 hours he was vindicated, with the sinking of the battleship *HATSUSE* and mortal damage to the battleship *YASHIMA*.

The presence of Russian minefields caused Japan embarrassment, and attempts were made by Japan to sweep the Russian mines using grapnels. These operations were largely unsuccessful and 3 Japanese cruisers were lost to mines whilst protecting sweeping operations. The same unsuccessful results dogged the Russian efforts at minesweeping. The naval war concluded with the mine playing an outstanding part in it, 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. The lessons of the war were very clear:

- The independent mine had been proved as an offensive weapon.
- The ability to sweep mines was required by any navy faced with a mine threat.
- The prompt notification of enemy mining is vital to the safety of the fleet.

For a period following the Russo-Japanese war, the coasts of Japan, China and Russia were polluted by mines which had broken adrift or had been laid and not swept. These mines caused considerable hazards to navigation and fishing as well as loss of life and commercial activity. The result of this situation was the eighth convention to the 1907 Hague Peace Conference. Two of the agreed articles are of particular note:

Article 1. Unanchored contact mines must render themselves safe after a specific time.

Article 2. Prohibits laying of mines off the coast of the enemy with the object of intercepting commercial navigation.

The First World War (1914-18)

The mine was used world-wide during the Great War. Germany was first off the mark with a number of minelayers being sailed prior to the declaration of war. One of these ships, the converted *KONIGEN LOUISE* was observed laying mines in the North Sea on 4 August. This news was passed to *HMS AMPHION* which set off in search, found and sank the *KONIGEN LOUISE* the next morning. Whilst returning to Harwich the *AMPHION* ran over the minefield and was sunk with heavy loss of life.

In Australia, remote from the European conflicts, offensive mining up to the outbreak of WWI was not considered a serious threat. It was recognized, however, that her capital cities represented tempting focal points for an enemy minelayer. As time wore on, the enemy failed to appear and patrols became less frequent despite the fact that the loss of 2 ships mined off Colombo in February 1917 sounded an alert for Australian ports. Australia entered the MCM era, when, in mid-1917, the German merchant cruiser *WOLF* laid a series of minefields around the Australian coast. *WOLF* proceeded to lay 4 minefields, the first off the north west corner of New Zealand, the second near Cook Straits, the third off Gabo Island and the fourth off Cape Everord. She completed the lay off Gabo Island on July 3 before proceeding to Singapore. On June 26, the 3 600 ton steamer *WIMMERA* fell victim off Cape Marie Jan Deimen. Her sinking raised alarm but no special measures were implemented. In any case, no MCM organisation existed in Australia at this stage.

On July 6, 1917, the steamer *CUMBERLAND* reported striking a mine 10 miles of Gabo Island and subsequently beached. Initial theories were that the explosion was the object of sabotage; however, as an added precaution, the navy decided to form a Minesweeping Section. Accordingly, trawlers were requisitioned and commissioned as minesweepers. On October 8, 1917, HMA Ships *KORAAGA* and *GUNUNDAAL* began sweeping off Gabo Island. The next day they swept the first of 12 mines. Australia's first MCM force had now proven the existence of mines.

Mine warfare during WWI reached full maturity and progressed through significant technical change. The main points were:

- The implementation of Passive and Self Protective Measures.
- The need for adequate numbers of minesweepers to counter a concentrated enemy mining campaign.
- The introduction of the magnetic influence ground mine.

Development Between The Wars

Development between the wars was largely biased towards refining existing weapons and developing sweeps to counter these weapons. The Russians were instrumental in developing another first in the aircraft laid mine for use in their northern areas. To counter this threat, a mine was produced for laying by aircraft through ice up to 33 feet thick.

World War II

An offensive minelay was conducted in Australian waters by the German raider *PINGUIN* assisted by the Norwegian tanker *STODSTAD*, taken in prize by *PINGUIN* and renamed *PASSAT*. The *PASSAT* was converted to the minelaying role to the east of Christmas Island in early October 1940, and proceeded south around Cape Leeuwin, south of Tasmania and laid about 110 mines in 4 separate lays in the Bass Strait area from October 30 to November 1, 1940. *PINGUIN* proceeded down the east of Australia and laid 120 mines in 3 lays off Sydney, Hobart and Adelaide during the period October 28 to November 7, 1940. All mines were of the moored type. As a result of these fields, 4 vessels were sunk and one damaged.

At the outbreak of WWII, Australia did not have a minesweeping force, but requisitioned some 11 trawlers for MCM duties. A minesweeper was in the design stage, however, and late 1939 the first of 60 *BATHURST* Class mine sweepers commenced building. These were the only allied minesweepers introduced during WWII which were designed and built outside UK or USA. They were rated as AMS (Australian Minesweeper) but later were widely referred to as corvettes. Following the *PINGUIN* minelay, it was assessed the primary threat to Australian waters would be mines.

The navy, realizing the need for defensive minefields, requisitioned the *BUNGAREE* in October 1940, commissioning her in June 1941. The *BUNGAREE* was a general purpose cargo ship built in 1937 and was of some 3 000 tonnes and could carry 423 mines. During the period 1941-43, she laid some 9 000 mines, mainly in the Great Barrier Reef area. The mines laid were all manufactured in Australia and were of the British MK14 moored mine type.

Despite a tremendous advance in technology, which included develpment of such things as, Magnetic Sweep, Acoustic Mine, Combined Influence Sweep and Pressure Mine, during WWII no new lessons were learnt, rather those from WWI were re-inforced but at a much greater cost.

Post War Operations

In the demobilzation and mine clearance operations after the war, the seeds of future disaster were sown. First the Soviet Union captured the majority of German mining work and put into production some of the designs captured. Secondly, allied minesweeping forces were run down.

Korea (1950)

The post war situation in the Far East was turbulent; in 1949 China was taken over by the Communists and in 1950 the former Japanese colony of Korea was partitioned. The Communist North (backed by both Russia and China) promptly invaded the South. During the advance of the United Nations army up the Korean Peninsula, an amphibious assault on the port of Wonsan was planned. The idea was to capture the port and hold it until the land army could advance up to it. The Russians supplied the Koreans with some very old, but still functional mines, as well as some of its new copied German ground mines, which were laid by junks. The results for the Allies was chaos. It proved impossible to clear the port, principally due to the lack of adequate modern minesweepers. In the whole Far East the Americans could only muster 22 minesweepers, of which 12 were Japanese manned, hired on contract to clear WWII minefields. Rear Admiral A.E. Smith summed up the situation clearly when he sent the following signal to Washington: 'We have lost control of the sea, to a nation without a navy, using obsolete weapons, laid by ships in use at the time of Jesus Christ'. The army captured the port on foot and kept it safe until the navy could clear the fields.

SUMMARY

In this article, I have discussed the development of the mine from a purely protective weapon barely capable of damaging ships, to a weapon which can be deployed strategically and tactically in offensive operations. Just as mining has taken its place in modern warfare, so too has the need for effective mine countermeasures. One point which I hope has become clear is the immediate effect even a minor offensive minefield can have on the war effort. To close, perhaps the most suitable quote would be that of Admiral Joy following the assault on Wonsan Korea:

'The main lesson is that no so called subsidiary branch of the Naval Service such as Mine Warfare, should every be neglected or relegated to a minor role in the future'.

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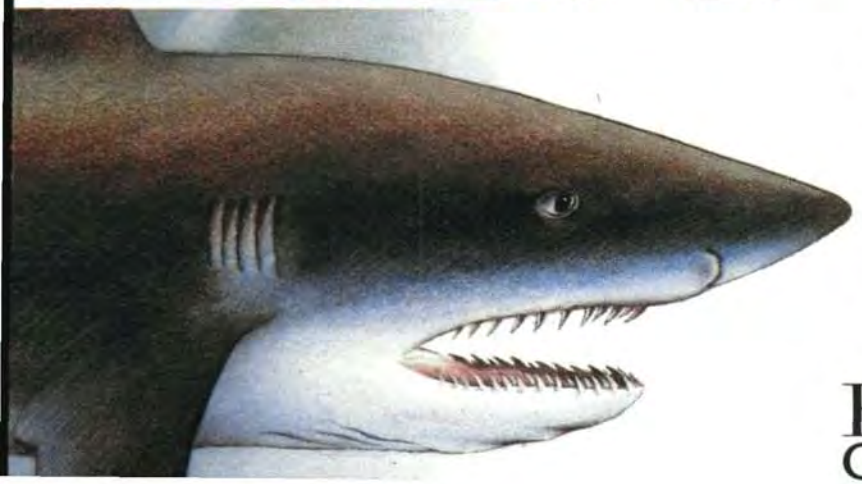

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Artist's conception of a minesweeper hunter (MSH) underway. The MSH is a new class of coastal minesweeper that rides on a cushion of air. Courtesy: Official USN Photo

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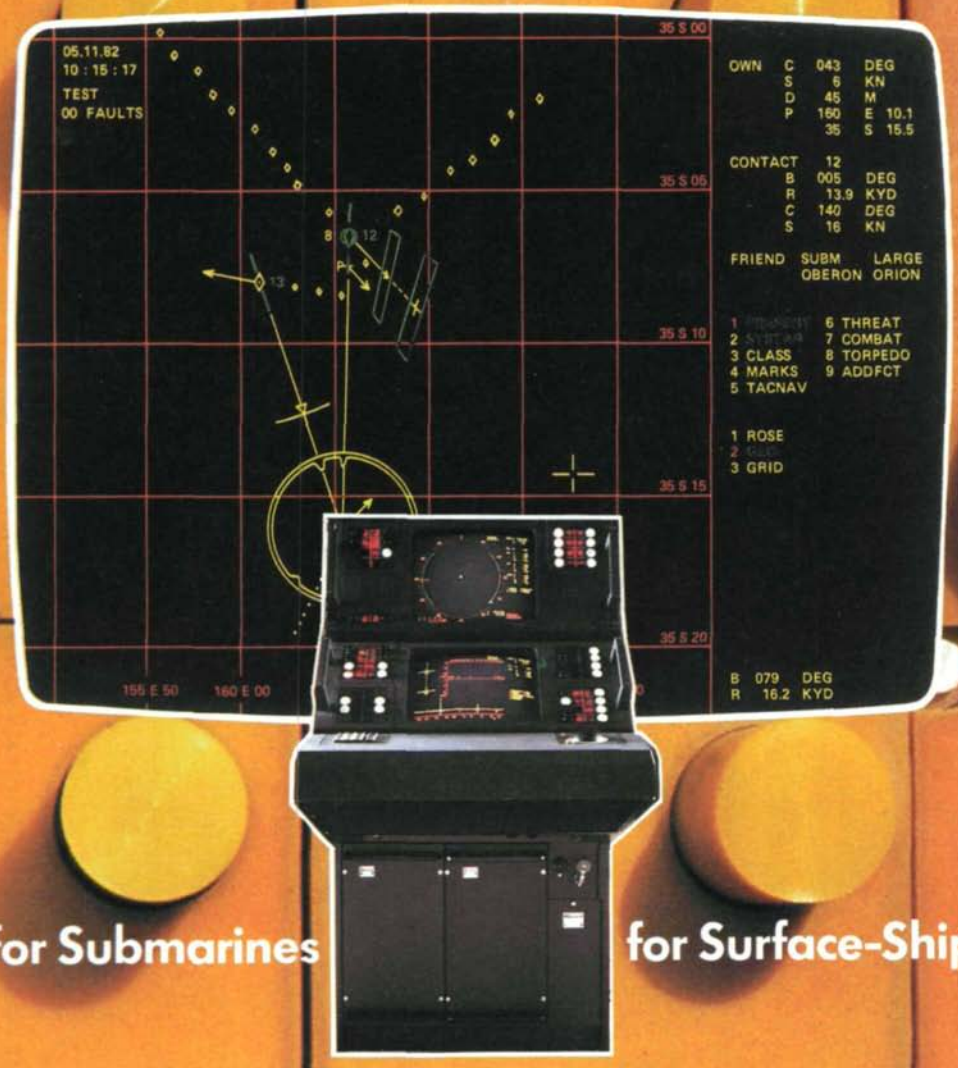

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WASHINGTON NOTES

by Tom Friedmann

How important is mine warfare to the United States Navy? How important is the bedrock of its fighting tradition?

On 5 August 1864, David Glasgow Farragut faced the full impact of mine warfare as ships under his command approached Fort Morgan at Mobile Bay, Alabama. The Bay was reported to be heavily sewn with mines. Despite Farragut's personal belief that mines were 'sneak' weapons and 'devilish' devices whose use were not 'worthy of a chivalrous nation,' the threat of mines, or 'torpedoes' as they were then called, had greatly influenced the planning for the attack. Farragut had even agreed to place his flagship, the *HARTFORD*, second in the line of battle instead of its usual place in the van because the *BROOKLYN* was equipped to sweep mines.

Shortly after 0700 hours, the US 15" gun monitor *TECUMSEH* opened fire on Fort Morgan and soon spotted the Confederate ironclad *TENNESSEE*. Hoping to engage the rebel ship as soon as possible, the *TECUMSEH* took what was to be a fatal short cut over the edge of the mine field. The ship struck a mine and rapidly capsized.

Ahead of the *HARTFORD*, the *BROOKLYN'S* captain reversed his engines on spotting what he believed to be the limits of the mine field, causing the Union squadron to bunch up behind him under the guns of Fort Morgan. Farragut, holding on to the lower main rigging of his flagship for a better view, demanded to know what the problem was. The actuality of mine warfare had already destroyed a new ironclad. Now the threat of mines placed the whole operation in jeopardy. Farragut became the first and last naval officer to blatantly ignore the danger of mines present, for only later did he learn that the rest of the mines were inert due to overly long submersion. Farragut issued the immortal orders 'Damn the torpedoes! . . . go ahead . . full speed!'

Thus, America's first admiral enriched our naval tradition with a great victory while tackling the two-pronged problem mine warfare has consistently posed to the naval commander, namely, the actual damage mines can cause and, perhaps even more dangerous, the *threat* of damage mines pose with its accompanying disruption of naval operations and interference with civilian commerce.

Although Americans had experimented with rudimentary mine warfare during the Revolutionary War as well as the Civil War, the US Navy dove head first into dangerous waters during World War I with the great North Sea Mine Barrage laid by the US and Royal Navies. Its execution, which continued through 30 October 1918, involved the laying of almost 57,000 mines of American manufacture and over 16,000 of British manufacture. For the United States, it was an outstanding example of rapid industrial production, improvisation, and the sheer determination to do a job, once professional naval commanders had determined the job that had to be done.

The effect of the Barrage, however, is still somewhat open to debate. Designed to prevent German U-boats from using the North Sea passage to the Atlantic shipping lanes as an alternative to the route through the English Channel which was by then closed by the Dover Mine Barrage and Dover Patrol of the Royal Navy, there is no accurate accounting of how many German submarines were lost.

German sources say that the antenna floats of the mines could be seen on the surface and thus

be avoided and that the Barrage could be skirted along the Norwegian coast until the closing days of the war. These sources do not credit the massive effort for causing any loss of submarines. Allied sources, on the other hand, seem to vary in their estimate of between four and ten submarines lost to the mines, which, in any case, is a very small number for the time and money expended.

The inter-war years were ones of limited development for American mine warfare forces, but nonetheless some progress was made. Experiments in degaussing to reduce the effect of magnetic mines were undertaken. The Naval Ordnance Laboratory was created and helped improve existing mines and mine equipment as well as developing new mines. The *USS ARGONAUT*, commissioned in 1928, was the first American submarine designed specifically to lay mines and for many years was the largest American submarine ever built.

The Second World War brought mine warfare to the world's oceans and inland waterways on an unprecedented scale. Improved moored mines, acoustic, pressure and magnetic mines changed the nature of mine warfare. New ideas to meet these threats were developed as mine sweeping became more and more sophisticated, while mines themselves were now laid by virtually every type of naval vessel as well as by aircraft.

Mines brought the fighting to the continental United States with the very successful operations off our Atlantic Coast. German submarines laid 338 mines which sank or damaged 12 ships, or one ship for every 28 mines laid. More importantly, during different periods, the ports of New York, Norfolk, Wilmington, Charleston, Savannah and Jacksonville were closed for a total of 33 days during the offensives. Charleston, closed at one time for 16 days, had by far the highest daily score, a dubious honor at best, considering the even greater importance it now has as an embarkation point for American forces.

Our most successful offensive mine operation was Operation Starvation. Conceived by the Navy in 1944, Operation Starvation was based on the belief that the war with Japan had reached a point that the Home Islands could be literally starved into submission through the use of a mine blockade. Between March and August, 1945, 100 Army Air Force B–29s dropped some 12,000 mines in the sea lanes in and around Japan. The results were as devastating as predicted.

Although the Navy would never be able to tell whether the mine offensive would have ultimately been as decisive as it envisioned, what it did know was that 431 ships, totaling over 900,000 tons of shipping, were lost, at a rate of 29 ships for each aircraft lost and 28 mines laid for each ship lost, the latter being the same ratio the Germans had achieved earlier against us.

By the time the first atomic bomb was dropped on Hiroshima, Operation Starvation had virtually sealed the shipping lanes of Japan and seaborne transportation, which had accounted for 75% of the transportation within the islands by late 1944, had all but terminated. Destruction of the Imperial Japanese war machine had become a question of time before time ran out on 6 August 1945.

Peace brough a concomitant run down in mine warfare forces. For example, the Pacific Fleet had over 550 mine sweepers at its disposal at the end of the war. By the outbreak of the Korean War, only 22 mine sweeping vessels were at the disposal of the Commander, Naval Forces Far East, of which 12 were *Japanese* vessels under contract.

Korea provided us with an example of what can happen when mine forces are left to rot. Off Wonsan, over 3,000 of what must have been every type of mine in the Soviet arsenal had been laid by the North Koreans. And we wanted Wonsan. What was intended to be a five day sweep prior to an attempt to seize the port took 15 days and held up assault forces at sea for *eight days*. Rear Admiral Allen E. 'Hoke' Smith informed the Chief of Naval Operations that the Navy had lost command of the sea in Korean waters. Vice Admiral C. Turner Joy, Commander, Naval Forces Far East and the Chief of Naval Operations, Admiral Forest P. Sherman, reluctantly agreed with Smith's assessment, leading Admiral Sherman to comment that he could all too easily think of circumstances where an eight day delay off-shore could mean losing a war.

Commander Malcom W. Cagle, USN, and Commander Frank A. Manson, USN, in their book, *The Sea War in Korea*, traced the expansion and perservance of our mine force during that conflict. The authors effectively make the case that modern equipment and tactics were not enough for a good mine force. Prompt and accurate intelligence was of 'immeasurable value' to mine countermeasure warfare. Mines, they pointed out, can be most easily destroyed *before* they are planted:

> 'Similarly, the destruction of mining facilities limits the number of mines that can be planted. Accurate intelligence as to the location and composition of mine fields makes the mine counter-measurers problem relatively simple. It may permit avoidance of the mine field if conditions are not favorable for mine sweeping.'

Because of the lessons of Korea, the 1950s saw a major expansion of the US mine sweeping force, but as fast as it grew, it melted away during the late 1960s and 1970s in large part through foreign transfers.

Large scale mine warfare was a last minute development during the Vietnam War. From May to December, 1972, some 11,000 mines were laid in Vietnamese coastal waters and inland water ways. The Port of Haiphong was closed for *300* days tying up 29 ships in harbor. Within days of the completion of this mining effort, however, the Paris Peace Accords committed us to their sweeping, later code named Operation End Sweep. But in this operation, we had a headstart. Rear Admiral Brian McCarley, USN, who commanded Operation End Sweep, has observed that we knew everything about the mines involved since they were ours and that they could be easily and effectively swept by our mine countermeasure forces. In fact, 'the vast majority of the mines were programmed to self-destruct and the remainder to go inert after a given time. Thus, even as the mines were dropped, the process of mine removal had been started.'

Operation End Sweep is perhaps most notable for moving helicopters from the surveillance and reconnaissance missions they flew for surface sweepers in Korea, to direct countermeasure work through the use of the Mk 105 minesweeping sled towed by the RH 53D Sea Stallion helicopter, a concept which has proved highly successful and is currently being tested brother navies, including that of the Soviet Union. US mine countermeasure forces have remained active since Vietnam. Helicopters were sent to aid Egypt in sweeping the Suez Canal after the 1973 Arab-Israeli War, and have recently completed a sweep of the Canal and Red Sea in search of mines laid by unknown parties.

Today, the US faces a situation where virtually every Soviet surface ship has the capability to lay mines, as well as many submarines and merchant vessels. Nearly every Soviet long range aircraft can be equipped for mine laying, including *BADGERS, BEARS* and *BACKFIRES*. Soviet mine sweeping and mine hunting forces number *over 300 vessels*. All of these are backed by an estimated arsenal of some 300,000 mines. And the United States?

To meet its own mine countermeasures mission of world-wide deployment for multi purpose missions, clearing US and foreign ports and harbors of mines, keeping vital sealanes open, maintaining surveillance over US and foreign coastlines, neutralizing a variety of mines, and performing peacetime support missions, the Navy has some 25 active and reserve duty vessels as well as a handful of RH-53D helicopters. In regard to mine laying, there are no surface mine layers and, while our submarines can lay mines, the number of aircraft that can do the same in no way approaches that of the USSR, and of those, only 80 are long range B-52s which have been specially adapted for the purpose. Beyond this, it is estimated that the United States has only one–tenth the number of mines in storage as does the Soviet Union.

With such a wealth of experience drawn from battle all over the world and having fought a mine war in Korea against the Soviets through their North Korean surrogates, it is only reasonable to question the erratic course of our navy's commitment to mine warfare. Different reasons have been given over the years but they lack a sound basis.

As early as 1920, Admiral William S. Sims, Commander of US Naval Forces in European waters during World War I, commented in his book *Victory at Sea* that, before 1914 'the business of mine laying had been unpopular in the American navy as well as in the British; such an occupation, as Sir Eric Geddes (First Lord of the Admiralty) once said, had been regarded as something like that of "rat catching".' Admiral Sims did observe that this branch of the service recieved more respectful attention as the submarine menace grew. Unfortunately, that interest had already waned by the time the Admiral's book was published.

Former Chief of Naval Operations Admiral Elmo Zumwalt has observed that the Navy had been divided into three powerful unions since the end of World War II, the aviators, the submariners and the surface sailors. Mine warfare fell outside any of the 'recognized unions' and withered as a result. 'No union' Zumwalt observed 'has a vested interest in mines, which have no bridges for captains to pace.'

But the 1970s brought Chiefs of Naval Operations who looked beyond the 'unions' and recognized the need for strong mine forces. The real turning point came in 1979 with the appointment of Rear Admiral C.F. Horne III, as Commander, Mine Warfare Command. Detached only earlier this year, Admiral Horne served as the prime mover behind the restorationof America's mine warfare capabilities through his untiring efforts to raise the mine consciousness of naval officers and legislators at home and overseas. The US Navy is planning an overall upgrading of its mine warfare program. The center of the new mine countermeasure (MCM) force are the ships of the *AVENGER* class. The lead ship was laid down in 1983 and

Mediterranean Sea . . . Two members from Explosive Ordnance Disposal Team Two Detachment 40 (EOD-2 Det 40) work from an inflatable raft while participating in exercises conducted by Mine Countermeasures Task Group 1-81 (MCMTG 1-81). The task group, consisting of navy units from 7 NATO countries, was formed to increase their mine countermeasures capabilities.

Official USN Photo

Atlantic Ocean . . . A dummy mine is installed on the rack of an S-3A Viking antisubmarine aircraft on the flight deck of the attack aircraft carrier USS Forrestal, CVA-59. The aircraft is undergoing carrier suitability testing while the Forrestal operates off the coast of Virginia.

Official USN Photo

was launched this year. These ships are wooden hulled with fiberglass superstructure and will be able to sweep deep-moored mines as well as magnetic and acoustic mines. One Honeywell mine neutralization system, a remote mine hunting and destruction device, will be carried. The latest Raytheon-Thomson CSF SQQ 32 sonar will eventually be fitted to all ships of the class.

A smaller mine hunter (MSH) is to be built. A contract award between Peterson Builders design similar to the *AVENGER*, and a glass re-enforced air cushioned vehicle designed by Bell Aerospace was to have been made by the end of August of this year, but, as of the date of this writing, no selection has been made. Although the traditional Peterson design would undoubtedly bring the benefits of similar equipment and fittings to that of the MCMs already under construction, this would, nonetheless, be an outstanding opportunity for the Navy to investigate the practical use of the air cushioned vehicle Bell proposes through the construction of a multi-ship class. A major drawback that is readily apparent in both the new MCM and MSH design is the virtual absence of defence armament. Knowing how such ships have been deployed previously, certainly at least one modern anti-aircraft weapon should have been provided.

Another means of augmenting the MCM fleet being considered is to designate certain civilian vessels for mine hunting and work with these ships through the Naval Reserve in peacetime. Our Navy was particularly impressed by the results gained by similar vessels taken up from merchant service by the Royal Navy during the Falkland's operation.

Finally, the Navy is seeking to enhance its helicopter operations through the acquisition of 44 MH-53E Super Sea Stallion helicopters, a greatly improved versionof the RH-53D. The new helicopter will be capable of the most sophisticated mine hunting and mine sweeping duties, including the use of an improved version of the Mk 105 sled.

The Navy currently has large stores of the Mk 52 and Mk 55 bottom mines and the Mk 56 moored mines, all of which are anti-submarine weapons developed in the 1950s. New mines include the Mk 60 Captor mine an 'encapsulated torpedo' which releases a Mk 46 Mod 4 acoustic homing torpedo when a hostile submarine is detected. Early 'bugs' have apparently been worked out in the Captor and procurement is back on track at about 300 per year.

The Mk67 SLMM (submarine-launched mobile mine) is currently under development. The SLMM is a bottom mine intended for the covert mining of enemy waters, to be launched from a submarine or other submersible vehicles.

Finally, there is the Quickstrike series to be used for shallow water mining of 'choke points' and harbors. Deployed from aircraft or ships, Quickstrike is a magnetic mine converted from 500 lb, 1,000 lb, or 2,000 lb standard aircraft bombs. The number of Quickstrike devices to be procured has not been made public at this time.

The Navy is experimenting with minelaying from portable rails on surface ships and also contemplating the use of C-130 aircraft to augment aircraft currently used for minelaying which include, along with B-52, the P-3, A-6 and A-7 aircraft.

Last but far from least, mine warfare is being recognized for the specialty it is. Tours of duty with mine forces are no longer considered deviations from earlier paths that 'anyone' can perform. As in so many other areas, the complexities of modern technology have brought respect and status for those who master them.

Once again, the United States appears to have been lucky in that we have not had to deploy forces to counter mine threats much greater than our recent joint sweep of the Gulf of Suez and Red Sea. The problem we face today is that the available surface anti-mine capability of the United States Navy just about equals the number of mine sweepers available at Wonsan in 1950 when we conceded control of the sea. The new construction, unfortunately, will barely keep up with attrition. Mine laying capabilities are severely limited for any contemplated offensive or defensive action.

Nevertheless, a dangerous chink in our armour has been spotted and active steps are being taken to remedy the technical if not the numerical problems we face. It cannot be too soon; as Admiral Forest P. Sherman commented after Wonsan:

> 'When you can't go *where* you want to, *when* you want, you haven't got command of the sea. And command of the sea is the rock bottom foundation of all our war plans. We've been plenty submarine-conscious and air-conscious. Now we are going to start getting mine-conscious . . .'

Hopefully, the circumstances will never arise that would permit us to determine whether the three decade gap between Admiral Sherman's words and the Navy's actions have been too great.

AUSTRALIA'S USE OF THE SEAMINE IN THE 1990s

by Lieutenant A. Hinge RAN

Today, as in the past, many people consider the mine as an old fashioned, ineffective, unglamorous and even immoral weapon. It has been argued that such a simple weapon has no significant role in the allegedly high price, high pace, high technology confrontations and wars of the future. The aim of this article is to show that the mine has a brighter future than ever as an increasingly cost effective and flexible weapon, capable of strongly supporting the defence of Australian national interests. In particular, it will be argued that the mine's utility as a sea-denial weapon will be instrumental in the defence of Australia's territorial integrity against possible challenges for resource wealth towards the end of the century.

Problems for Australia in the 1990s

In 1995, it is almost certain that less than 0.3% of the world's population will be living on the Australian continent. It is also certain that the continent and Economic Exclusion Zone (EEZ) will still hold at least one quarter of the world's known uranium reserves in addition to enormous mineral, oil and fishery reserves.[1] Australia's Antarctic territory also represents a large area with as yet unknown resource reserves open to challenge.

To our north is a rapidly developing region composed of nations with increasing populations and growing demand for energy and other resources by which to sustain economic and social progress. The region is populated by many relatively new sovereign states following an apparent world-wide trend of becoming more nationalistic, protectionistic and militaristic. As essential oil fields, fishing grounds, mineral deposits and other available reserves deplete, the small Australian population's right to such a disproportionate share of the planet's wealth may be challenged in various ways. Areas of Western Australia, the Economic Exclusion Zone (EEZ) and Antarctica may becoming increasingly vulnerable and attractive targets for lodgement and exploitation by developing and even developed nations. Limited warfare tactics could well be used against Australia ranging from sporadic attacks against vital points, harassment of shipping, fishing and oil production, to regular intrusions into Australian waters, and introduction of illegal immigrants. A limited or even major lodgement in an isolated area of the continent is also a possible avenue for establishing a political precedent for subsequent 'immigration'.[2]

Australia is unlikely to have sufficient sea assertion and surveillance forces to both defend the EEZ and maintain sea lines of communication against harassment. The development of a solid and diversified protective, defensive and offensive Australian mining capability will provide the nation with an enhanced defence in depth and supply a useful supplement to the activities of a small navy and airforce charged with the formidable job of defending a massive continent with an equally massive EEZ. In addition to these important considerations, the mine's utility as a weapon of limited war will give political decision makers vital options not provided by other weapons systems in future conflicts.

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The Mine's Use in Future Conflict

The mine has consistently proven itself effective in all major twentieth century conflicts and has established itself as a valuable instrument in limited warfare. During the Vietnam War in 1972, the mine was the only politically practical means of cutting off North Vietnamese sea traffic and resupply. The mining of three North Vietnamese harbours achieved the vital strategic objective of imposing a highly effective, cheap and non-escalatory naval blockade. Fifty foreign vessels were bottled up in port for 300 days. As a direct result, supplies reaching communist combat units was reduced by an estimated 300—1500 tons per day. The increased traffic required on the overland resupply route made the communists more vulnerable to air interdiction and their casualties increased significantly. It has been argued that the laying of mines had a vital impact on the result of the last co-ordinated US offensive against North Vietnam and acted as a potent political lever by which to make the communists more amenable at the Paris conference table.[3] Sir Robert Thompson, highly respected strategist of the Malayan Emergency and outspoken critic of the conduct of the US campaign in Vietnam highlights the value of the mining in the following quote:

> 'The mining was aimed at reducing Hanoi's future capability to continue the war at the pace Hanoi itself had set . . . a far more important purpose was the message which it conveyed to the Russians: "If you arm your allies, you must expect an appropriate American response which may involve you". The Russians got the message at once'.[4]

The mine thus re-established itself as a potent tool of limited war in that it was quite openly used in a period of national revulsion to warlike actions. It was acceptable to the American people as a form of warfare because it was used effectively, without directly killing people or devastating property. The enemy had to make a conscious decision to challenge the field and run the gauntlet. The level of violence was minimized as well as the potential for escalation involved in imposing a normal naval blockade against the predominantly Eastern bloc supply ships.

The successful mining of North Vietnam to achieve limited objectives' graphically demonstrates the unique psychological effect of mine warfare. The psychological warhead of the mine can be exploited by efficient and imaginative Australian planners. The mine has a different psychological effect when compared with directly aimed or active weapons. The mine is a passive, unaimed weapon which the German submariners of both world wars feared above all other weapons. They felt that these automated, impartial and implacable enemies were patiently waiting for them to make a mistake and kill them mercilessly: no questions asked and no quarter given. The success of the North Sea Barrage in WWI eventhough it offered less than 10% kill probability is testimony to the deterrent effect of mining against submariners. The hidden, lurking nature of the mine had sinister, even evil connotations for these intrepid U-boat men. The effect on morale was such that few skippers would knowingly go up against a field. In history, there have been many blockade runners but precious few minefield runners. The mine's psychological warhead will continue to breed apprehension, shock, surprise and fear as men continue to feel naked before it. It will also continue to inject a persistent amount of caution and uncertainty into the planning and implementation of hostile naval operations against Australia.

The mine satisfies the present and future requirement to possess a less destructive means by which to achieve the limited objectives of regional confrontations involving Australian national interests. In stating this, it must not be inferred that the mine is in itself less destructive; on the contrary, mine fields sank more vessels in WWII than any other weapon. The point is that the mine, in eliminating escalatory eyeball to eyeball confrontation between forces can stabilize crisis situations, buy precious political bargaining time and deliver a measured military response to a hostile act. Let us take the hypothetical 1995 example of foreign vessels continually entering the northern Australian EEZ, effectively challenging Australian rights to the oil, gas, fishery and mineral resources contained within. Given that the foreign vessles had the support of their home government, the Australian government might react by dispatching a suitable Australian ambassador such as an F-18 or FFG. Ultimately these active Australian defence units, given continued foreign infiltration, would either have to pull the trigger or back down, the former action being highly escalatory, and the latter being an effective denial of sovereignty and a serious blow to national prestige. In such a rape environment, the mine offers itself as a valuable option when dealing with such challengers. Against the resource burglars of the future, the mine can act as a 'robot policeman'. The mining of the disputed area would send a clear 'keep out' signal to the challenger and would be indicative of an Australian national determination to hold on to its territory. The challenger would enter the

EEZ at his own risk against a rapidly deployed, extensive field of two thousand pound mines. The planting of such field would be a low risk, politically attractive means of naval blockade and a convincing declaraton of an exclusion zone.

In the future, at least at the onset of many limited crises, traditional forms of warfare may be too provocative or escalatory. Mining can buy time, maintain ground and provide decision makers with an effective, decisive and low risk military response. The mine, as Australia's 'robot policeman', supporting a thinly spread Navy and Air Force in the resource hungry world of 2000 AD could maintain an all-weather, 24-hour per day vigilance, confirming our national claim to an extensive EEZ. In the final analysis, it would be considered a form of 'Surveillance by Fire' when other surveillance forces are committed elsewhere.

It can be argued that the mine not only denies the challenger use of the disputed area but also the alleged legitimate owner is denied access. This is basically true; however, the mine will have achieved some critical objectives. First, it will deprive the challenger of the victory which would have been won if no direct military action was taken against him. Secondly, it buys time for the Australian political and military leadership to crisis manage without making costly and possibly humiliating concessions. Time would also be available for 'third parties' to intervene before a military *fait accompli* was claimed by either of the disputing parties. Finally, the use of mines would be perceived by the challenger, the world and the Australian electorate as an effective and decisive action, since the mine, once deployed, issues no communiques and will not surrender. Besides these important considerations, the minefield remains ours. The mine sterilizationtime, ship count number, actuation characteristics, location, concentration and other programmable mission parameters are known by the user, in this case the Australian Government. Modern technology can even supply mines capable of being switched on/off by various remote means providing temporary transit paths for friendly units on an 'as required' basis.

It could also be argued that the Australian EEZ has too large an area to mine in the case of non-specific area infiltrations. An option could be the offensive mining of the challenger's home waters or shipping lanes to cause him proportionate inconvenience. In an extreme case, submarines covertly laying Hi-mix mines could cause the closure of the challenger's ports. Surprise Rapid Aerial Minelays (RAMs) conducted by F111, P3 and C130 aircraft could also achieve this aim at the beginning of a serious confrontation when the challenger's air defence guard is down. In fact, Australia currently has a formidable RAM capability in that each P3 Orion is capable of carrying seven 2000 lb mines and a number of smaller mines. Also, under the Cargo Aircraft Minelaying (CAML) scheme, the C130 is capable of rapid conversion

A Mark Six, Mod Five anchored mine hits the water.

Courtesy: Official USN Photo

to a minelayer able to deploy sixteen 2000 lb mines.[5] The outstanding success of RAAF Catalinas in the RAM role during WWII is sufficient testimony to the utility of aerial minelaying in the waters of South East Asia.[6]

The tactical use by Australian naval and merchant vessels of Covert Surface Minelays (CSM) is yet another area where the use of the mine can deliver large dividends during a conflict. Australia's region of interest to the north, through which any long term incursion or lodgement force would probably come, abounds with narrow straits,numerous islands and other such choke points and ambush sites. Minefields could significantly assist in the dislocation of an enemy war effort by the destruction, or threat of destruction, of his naval forces and logistics supply. During one night in WWII, three ageing US minelayers, the *BREESE, PREBLE* and *GAMBLE* laid mines in the Blackett Strait of the Solomons and on the same night three Japanese destroyers, the *KAGERO, OYASHIO* and *KUROSHIO* were sunk.[7] Only imagination limits the use of these unique and versatile weapons in the future defence of Australia against all manner of threat.

The Mine as Protector

Australian harbours, ports and coastal routes are vulnerable to covert mining by unfriendly forces. The best mine countermeasure is the use of our own mines. Mines can be effectively employed around important harbours, oil rigs and coastal routes in a protective capacity in order to prevent the close approach of hostile surface vessels and submarines.

The effectiveness of the mine in a protective capacity was probably exemplified by the failure of the 250 ship UN Amphibious Force to take the Korean coastal town of Wonsan during the Korean War. This supposedly simple amphibious operation was held up for eight days by three thousand simple Soviet mines quickly deployed from sampans by inexperienced North Korean troops under the supervision of three Soviet advisors. The town was eventually taken from the rear by an ROK unit. At the end of the War, Vice Admiral C. Turner Joy, Commander Naval Forces Far East said:

> 'The main lesson of the Wonsan operation is that no so called subsidiary branch of the Naval service, such as minewarfare, should be relegated to a minor role in the future. Wonsan also taught us that we can be denied freedom of movement to any enemy objective through the intelligent use of mines by an alert foe.'[8]

The mainuse of protective fields in Australian waters during the next decade will probably be against submarines. In future, a number of anti-submarine fields could be laid in Australian waters to protect ports, harbours, oil rigs and coastal shipping routes. Also, a number of random fields could be sown to act as a powerful deterrent to unauthorised submarine activity within the EEZ. The existence of these fields would be declared but not their nature, location or extent. This would prove a significant form of anti-submarine surveillance (by fire!) and would indicate that the Australian government meant business. These fields would be few and far between during peacetime, but could be rapidly stocked up at the onset of conflict. Initially, they would generally be composed of a basic galvanic antenna anti-submarine mine and locations would be known to Australian submariners and 'need to know' authorities. More sophisticated ASW mines could be laid as the situation warranted. Such mines as the Encapsulated Torpedo (Captor US Mk 60 mine) with a kill radius of one kilometre could be used to effectively protect high priority targets. Captors have been laid by submarines with 21 inch torpedo tubes and P3C aircraft during testing in the United States. They can also be laid by a wide variety of surface vessels.

Australian Mine Production and Development

A mine is basically a metal casing packed with explosive, batteries, safety and arming devices, together with some form of target detection device which determines just how 'smart' the mine is. The target detection device incorporates the influence sensor(s) (magnetic/acoustic/pressure/combination) together with a processing unit which can range in complexity from a basic mechanical or electrical relay to a microprocessor. In the case of buoyant or moored mines, a mooring cable and sinker unit is also required.

Australia has the material and technological resources by which to manufacture all but the most complicated mines. Australia could certainly manufacture all mines required for protective and defensive purposes. Sensor and target detection devices of good quality (as opposed to best quality) could be constructed using current resources. Most protective mines would be elementary in nature, requiring few, if any, anti-sweeping properties as they are laid in territorial waters. Defensive minefields involving the laying of mines in international waters in order to protect sea lines of communicationwould need certain basic anti-sweeping characteristics which could be easily provided by Australian industry. It is well known

First known mining of Australian Waters by USAF: Kangaroo 81.

Courtesy: Photo supplied by Captain Donohue

among mine countermeasures (MCM) personnel that mine sweeping is severely complicated by relatively simple mines which incorporate ship counts with the addition of intermittent arming and delayed arming. More problems can be thrown in by including a fixed intercount dead period and a facility whereby a mine fully arms if it does not detect any ship activity within a fixed period of days. Such mines as these could also be effectively used in many offensive mining applications.

Special Hi-mix offensive mines covertly laid by submarines for such purposes as harbour blockade would need moderately more sophisticated anti-sweep facilities, high target discrimination and have flexible, programmable mission parameters so as to remain appropriate to a changing tactical situation. Such mines might be operated remotely in terms of activation, deactivation and sterilization. Some modern mines even have the capability to vibrate into a sandy bottom almost completely burying themselves once deployed. MCM units would truly find this an 'offensive' mine!

The operational value of simple mining material in the protective and defensive role is enormous. Its clever offensive application against opponents with little MCM expertise and equipment makes such material extremely devastating and very difficult to deal with.[10] The deployment of such mines in a protective role offers a good opportunity to involve the resources of the civil infrastructure. Portable minelaying rails can be quickly fitted and dismantled on board just about any ship of reasonable size.[11] Bottom mines have even been laid from speed boats and rubber dinghies in the past.

Many civil vessels would also be useful in an MCM role as makeshift hunters and sweepers during times of difficulty. A number of converted trawlers were employed by the British Navy in a minesweeping role during the Falklands campaign.[12] At present, a Vessels of Opportunity programme (VOOP) is being conducted by the Royal Australian Navy to further explore the possibilities of calling upon assets of the civil sector to substantially enhance Australia's MCM resources.

By involving the civil sector in mine-countermeasures, together with protective and defensive mining, the public would be better informed on an important defence matter. Perhaps a more cohesive and supportive population may develop once permanent forces get the community actively involved in defence? Even the most extreme 'peacenik' could have only few objections to the boosting of his country's MCM, protective and defensive mining capability by members of the civilian population. Involvement of the civil sector in MCM and mine deployment may become not only politically acceptable but politically attractive since the

mine will naturally draw public support. The Australian public can identify with the mine as a weapon defending the nation from external aggression and the use of the mine is in full harmony with the strategy of Continental Defence. Mine warfare also harmonizes with the historically and geographically derived insular, even defensive disposition of the Australian people. Even using the mine in an offensive capacity can be well within the constraints of world opinion in many scenarios when the use of more provocative weapons will be unacceptable. World opinion will always be a constraining factor in Australian politics and military decision making. This further enhances the use of the mine and its value to political decisionmakers and the civil population in future crises.

Conclusion

The mine is not the panacea of Australian defence problems. It is, however, a valuable tool in dealing with a large range of crisis situations which may be faced by our nation towards the end of the century. Also, as a potent sea-denial weapon, it will grow in value in the support of our relatively small dedicated sea assertion and surveillance forces.

The bold and imaginative use of the mine offers more promise than ever before in the management and limitation ot tomorrow's conflicts. The mine as it is developed will take its place in the mainstream of Australian defence planning as a relatively cheap, solid and diversified capability. The net results will be a signficant and cost-effective increase in Australian deterrent credibility and warfighting capability. Ultimately, it is believed that the mine will be instrumental, as a sturdy and reliable ally, in maintaining Australian territorial integrity against the challenges which are likely to come.

Notes

1. Colonel J M Hutcheson UNSWR. *Australia — The Undefended Source of Energy*. Defence Force Journal No 29, Jul/Aug 1981, P 6 (figures only are quoted).
2. These scenarios are adopted from a Strategic Assessment submitted to Parliament by the Joint Committee on Foreign Affairs and Defence in 1981.
3. Commander J D Taylor USN. *Mining: A Well Reasoned and Circumspect Defence*. US Naval Institute Proceedings, Nov 1977, p 42.
4. Robert Thompson. *Peace Is Not At Hand*. London, Chatto and Windus, 1974, p 115.
5. Squadron Leader G Skinner. *Aerial Minelaying: Possibly The Most Potent Sea Warfare Technique For The UK*. RUSI, Dec 81, p 60.
6. Commander A Lott. *Most Dangerous Sea*. Naval Institute Press 1959, p 215. (Lott points out that from July 1943 to July 1945, RAAF Catalinas laid 2,498 mines in 1,128 sorties with negligible losses. Their main target was Surabaya, Headquarters of the Japanese Second Southern Expeditionary Fleet. The harbour was closed 47 times with a total of 375 mines. These mines sank seven ships and damaged eleven more. Balikpapan, another major RAAF target, which produced 67,000 barrels of petroleum products for Japan per day (90% ot total Japanese requirements), was also often paralyzed by mines. The total number of vessels sunk by RAAF deployed mines was 90, totalling 39,384 tons.
7. Lieutenant Commander R Crossland USNR. *Unconventional Warfare Afloat*. US Naval Institute Proceedings, Nov 81, p 38-39.
8. M Cagle and F Manson. *The Sea War In Korea*. Naval Institute Press, 1957, p 151.
9. *Janes Weapons Systems 1983/84*. Reference 2541. 441.
10. See Captain J S Cowie. *The Operational Value of Simple Mining Material*. US Naval Ordinance Laboratory Report 2560. (NAVORD Report 2560 Declassified).
11. Lieutenant Commander J M Steussey USN. Comments on Admiral C Horne's article *New Role For Minewarfare* which appeared in the Nov 82 issue of Proceedings, pp 34-40. Streussey (Proceedings July 83, p 86) describes the rapid and efficient laying of 2000 lb MK-55 bottom mines using simple, inexpensive and portable minerails which were packed up immediately on completion of the lay.
12. *Falklands Operations*. Navy International, Nov 82, p 1438.

AUSTRALIAN MINE COUNTERMEASURE VESSELS — A DILEMMA

by Commander D. Ramsden RAN

We first survey the plot, then draw the model; then must we rate the cost of erection; which if we find outweighs ability, what do we then but draw again the model.

W. Shakespeare — King Henry IV Act 2

The Australian Mine Countermeasures (MCM) force has been reduced to the last of the six *TON* class vessels built in the mid 1950s and acquired by the RAN in 1962. The minehunter, *HMAS CURLEW*, has an effective sonar minehunting capability and shallow wire sweeping equipment but is limited in overall effectiveness by constraints caused by the age of the hull and installed equipment. At the time of writing, *CURLEW* is being programmed to pay off in mid 1985, but extension in service is being seriously considered to partially bridge the capability gap until new MCM vessels become operational in 1987.

The requirement to replace and improve on the MCM capabilities of the *TON* class has been recognised since the late 1960s and was first formally addressed in the early 1970s. Therefore it is fair to question why Australia did not enter the 1980s with a modern MCM force, instead of the current most unsatisfactory situation. The position is even more difficult to understand because there is complete agreement that Australia has a requirement for an MCM force. Indeed, the requirement has a high priority. It is also agreed that the first priority is a minehunting capability in waters classified as 'shallow', followed by a complementary 'shallow' water minesweeping capability. A deeper water MCM capability is required as well, but at a lower priority.

The explanation of the current situation has specialist MCM, financial and organisational aspects. There are lessons that need to be heeded when considering how to improve the current situation which involves a dilemma concerning the way ahead. In brief, the alternatives are either to continue down a radical path unique to Australia, or to revert to a conventional approach to MCM. Both choices have significant manpower and financial implications, and which path to follow is by no means clear.

The Birth of the Cat

MCM Vessels are very specialised examples of naval architecture because of the requirement for stringent magnetic, acoustic and shock standards. Not unnaturally, the plans to replace the *TON* class in the early 1970s were based on overseas developments because the specialised skills were not available in Australia. At that time, although most Western navies recognised the need for modern MCMVs, plans to build new vessels were only embryonic. The French *CIRCE* class were the only new ships that were actually built, although a number of other nations completed conversions of minesweepers to minehunters, as did Australia with *CURLEW* (1969) and *SNIPE* (1971).

The *CIRCE* class had no significant MCM capability improvement compared to the *TON* class conversions and was presumably rejected for that reason. The only other alternative, the UK '1970 MCMV' design, which was eventually to be launched in 1980 as the *HUNT* class, did offer significant capability improvements and combined shallow water hunting and sweeping in one ship. However, the cost even then was

The Author

Commander David Ramsden joined the Royal Navy in 1960. After service as a seaman in a frigate of the Fishery Protection Squadron, he was selected for upper yardman training at the Britannia Royal Naval College in 1963. Postings on completion of training included *HMS FISKERTON during the Confrontation period.* He attended the RN MCDO course in 1967 and joined the RAN in 1969 after a further posting as XO of *HMS KIRKLISTON* in Singapore.

RAN service includes Commanding Officer *HMAS SNIPE* in 1971-72, Commanding CDT 1 1974-75, FMCDO in 1976 and the RAAF Staff College in 1977. Sinced then he has been in Navy Office as Staff Officer MCD in DUW 1978-81, and Minesweeper Project Director 1983 to date, escept for an interval of two years from 1982-83 as the last Commanding Officer of *HMAS BASILISK* in Port Moresby PNG.

considered to be too high for a 'minesweeper' and the search for a lesser cost alternative started. (There has been a continual theme throughout MCM vessel acquisition considerati ons that although aircraft carriers, submarines, F/A-18s, helicopters etc can be expected to be expensive,mere 'minesweepers' cannot possibly cost much and there must be a lesser cost alternative.) The same situation as faced by Henry IV quoted at the start of this article now existed and the temptation 'to draw again the model' could not be resisted.

The minehunting and minesweeping requirement were separated, and the concept of the minehunter catamaran was born. The overall aim was to produce a craft that was less expensive than conventional MCM vessel designs and which could be produced relatively quickly in Australia. This very desirable aim was to be achieved at the cost of having a smaller and therefore a less deployable and more support dependent craft than a conventional MCM vessel. The resulting minehunter inshore (MHI) prototype design meets these criteria. It must also be emphasised that at that time, 1975, the UK *HUNT* class was only a design and current alternatives such as the *TRIPARTITE* and *LERICI* minehunters were even less defined and there was no assurance that they would be built.

Cost of the Cat

The overall cost of developing the Australian design has become high. Although the direct financial cost of the MHI still compares favourably with other MCM vessels, the indirect costs are significant. Not only is the craft deployment limited, compared to conventional MCMVS, but considerable man years of Naval Technical Services effort since 1975 has gone into acquiring the specialised skills and producing the design. Perhaps most serious of all, from a Defence capability viewpoint, a number of MCM vessel projects in other nations have overtaken the MHI prototype and are now in service while Australia faces a significant MCM capability gap. Finally, the infrastructure required to support the unique Australian minehunter through trials and evaluation into operational service is proving a significant drain on the overall available manpower and finance resources.

In passing, it is fair comment that a lot is being asked of the MHI considering that it is a prototype and is radically different from any other nation's design. Although it is perhaps too late now, recognition of the true prototype status of the project without any plans for production craft before the prototype was proved would have been more prudent. This was one of the advantages of the proposed *HUNT* buy, because the *HUNT* duplicated the MHI's minehunting capability as well as having additional minesweeping and deployment capabilities. Therefore, pressure for the MHI to be completed as soon as possible to reduce the capability gap would have been eased with consequent advantage for this prototype project.

Minesweepers

A further cost of the birth of the cat has been its effect on the complementary minesweeping requirement. This project has taken second place to the MHI and, apart from a period in 1981/82 when an 'opportunity buy' of the UK *HUNT* class was considered, has had little priority for finance and manpower because all the available specialist effort was devoted to the MHI. (Again, the apparently high cost of the *HUNT* was presumably a major factor in that acquisition being cancelled). In contrast to the MHI, the total technical effort expended on the minesweeper can be measured in man months rather than man years.

In addition to the resource aspect, the very existence of the MHI has constrained the procurement options open to the minesweeper project. It is difficult to justify an MCM vessel which would duplicate in part the minehunting capability of the MHI, and this is exactly what the majority of the current MCM vessels being built overseas do, because they have an inshore minehunting capability as part of their overall MCM weapon fit.

Modern MCMVs are either single role minehunters such as the *TRIPARTITE*, and *LERICI* or dual role hunter sweepers (*HUNT, M80*). In addition, most MCM vessels now under construction or being designed are also minehunters. There is no modern minesweeper design, with the exception of the very specialised craft such as the West German *TROIKA* unmanned craft and Type 343 minesweeper/ minelayers or the UK deep water *RIVER* class, and these do not meet the overall Australian shallow water minesweeping requirement.

Given that the prototype MHI will provide the inshore minehunting capability, and it should be noted that this is not the same as a shallow water minehunting capability because of extensive unprotected shallow waters around Australia, the problem is to provide a complementary minesweeping capability. This minesweeping capability does not necessarily need to be one vessel type to cover the required depth range and also have the desired sea keeping abilities. A radical two vessel type option is currently being developed which aims to concentrate the requirement for the stringent magnetic/acoustic/ shock characteristics required for shallow water

minesweeping in a small minesweeping launch (MSL) at proportionally less cost than a conventional minesweeper with the same characteristics. The mid depth range to deeper water would be covered by a larger vessel (MSO) with less stringent influence characteristics and possibly built of minimum magnetic steel. Again, this larger vessel could be less expensive as it does not require such stringent influence characteristics as a conventional minesweeper.

This radical proposal requires research and development effort which is now underway and is aimed at providing data for the MSL and also shallow water influence sweep capability using craft of opportunity (COOP) in the first instance.

It is relevant that this MSL proposal has a similar 'cost' to the MHI in that it will be very support dependent. However, this may be acceptable as the waters it is required to operate in are mainly in the vicinity of ports.

The situation then is, not only is there no modern overseas MCM vessel which meets the overall minesweeping requirement without duplicating the MHI minehunting, there is no known developed design that could be acquired for construction without signficant additional design effort. In addition, experience with the MHI has shown that development of an Australian MCM vessel design is expensive in resources.

The Dilemma

The parallels now with the situation when the MHI was born are extraordinary. There is some urgency to produce replacement MCM vessels, as there was in 1975. No overseas MCM vessel or design meets the requirement, which again is similar to 1975. Finally, a radical new MSO/MSL approach unique to Australia is under consideration. The difference from 1975 is that the financial and other costs of the radical minesweeper approach are estimated to be of such an order that Henry IV's situation is repeated, and the temptation is to 'draw again the model'.

The dilemma then is whether to accept the high cost and risk of the radical Australian approach, or purchase an overseas MCMV which does not meet the overall minesweeping requirement and is also costly. Both are unattractive, the first because of technical risk and the resource cost, and the second because it would involve purchasing a costly vessel that does not provide the total capability required. There is no simple answer, but recognising the need to keep an MCM infastructure and also Defence budgetary limitations, the current plan to further investigate the radical Australian approach will provide the possibility of an operational influence sweep in the short term and data for further development. In the meantime, other Western navies are expected to tackle their replacement minesweeper requirements and a suitable design could emerge in the late 1980s.

The second course of action, the acquisition of an overseas design and subsequent build, either overseas or in Australia (this is another dilemma worthy of separate examination), can be expected to be expensive in direct Defence budget terms. Nevertheless, it would avoid the significant design, time and infrastructure costs that are similar to that expended on the unique Australian MHI which the RAN will find difficult to afford in the future, unless there is a significant change to the projected manpower and budgetary situation. Finally, should the RAN wish to develop at least part of the operational minesweeping capability now, the deep water requirement, although of lower priority, could be met at an overall cost much lower than the shallow water requirement, by using a design similar to the UK *RIVER* class and/or craft of opportunity (COOP).

The only relatively quick solution to providing anything other than the inshore minehunting capability of the MHI, is either to develop the lower priority deeper water capability (*RIVER* class/COOP approach) and/or develop further the radical Australian approach to inshore minesweeping. The alternative of pursuing the conventional approach at this stage, when a new design MCMV is required to meet the requirement, would require a massive diversion of resources which would distort the capital procurement programme. Therefore, the way ahead being investigated is limited to further development of the radical Australian approach which requires only limited resources at this early stage. The timescale require to prove this radical concept is such that conventional minesweepers may emerge in the late 1980s and a decision on whether to stay with the Australian approach or to revert to conventional MCMVs will be required at that time.

SHIPS AND THE SEA

CITY OF ADELAIDE

The full rigged ship *CITY OF ADELAIDE* (later *HMS CARRICK* and *SV CARRICK*) should not be confused with the steam, water-jet propelled life-boat of the same name. Both are still in existence even if they are at opposite sides of the world. Without a doubt, the ex-clipper is in a better state of preservation. The other alas, is slowly rotting away on a beach at Port Lincoln. She too is worthy of a short article in a future Journal, observing that water-jet propulsion in the 1880s was somewhat unique.

The clipper *CITY OF ADELAIDE* must be one of the oldest ships afloat and still in use today. Her roles and appearance have changed with the years, but underneath exists a survivor of the days of elegance, speed and the seafarers' trust in skill and the elements.

Built by William Pile of Sunderland (UK), *CITY OF ADELAIDE* was not a large ship: 791 tons with the dimensions 176.8 ft long, 33.2 ft beam and 18.2 ft depth. Built for the shipowners Messrs Devitt and Company — later Devitt and Moore — she was their third vessel, but holds pride of place as their first ship, purpose built to compete with two other England/Australia shipping companies, namely Orient Line and A E Elder & Company.

Composite built of copper sheathed teak on iron frames, *CITY OF ADELAIDE* was launched on 7 May 1864, some five years before that other composite clipper *CUTTY SARK*. Carrying 1500 tons of cargo, first and second class passengers and immigrants, she spent her whole life under the Devitt and Moore flag on London-Adelaide-Port Augusta-London voyages. General cargo and passenger out to Adelaide: wool, hides and passengers for the return.

Fully rigged, her original sail plan did not include the easier to handle double topsails, rather she kept the larger and more cumbersome single sail with three sets of reef points. A study of the plan reveals main, topsail, topgallant and royal on all three masts plus three jibs and spanker. We should remember, however, that crack ships of this era carried large crews and that Masters were not afraid to drive their ships hard.

In researching this ship, I have found two items of note, both in their own way worth recording:

- In 1867 under the command of Captain John Bruce, she established a record run, London to Adelaide (pilot to pilot) of 65 days. Jointly held with *YATALA* (Orient Line) this record was beaten in 1881 by that other wonderful clipper *TORRENS*. (A E Elder and Co).
- The only major accident to *CITY OF ADELAIDE* was her stranding off Henley Beach (SA) on 24 August 1874. Top-gallant masts and yards were sent down, cargo part discharged and with the help of two tugs, she was towed clear on 4 September. A survey showed that no damage had ensued.

CITY OF ADELAIDE was a family ship, and proof of her popularity in this role is summed up in a precis of a story told by Captain A G Course in his book *Painted Ports*. A newly married couple (Mr & Mrs Welford), sailed in *CITY OF ADELAIDE* to Adelaide in 1864. On their return to England in the same ship in 1872, they had with them their 3 children. The clipper was becalmed off Cape Horn and their son Sidney had the unusual experience of being rowed around the ship off the Horn. The Welford's fourth child (and second son) was born on board off the Scilly Isles on 30 January 1873. To complete the scene, Mrs Welford and 4 children returned to Adelaide in the same ship in 1874.

In her Devitt and Moore career, *CITY OF ADELAIDE* only had four captains:

1864–1873 Captain John Bruce. A Scot with a ready wit, renowned for his standard dress of black broadcloth, straw hat and pugaree. Certainly a colourful person especially when we consider he had a wooden leg.

1873–1875 Captain L W E Bowen. A competent ship-master, but the only man to put *CITY OF ADELAIDE* ashore, albeit with no subsequent damage.

1875–1876 Captain Alexander Bruce.

1876–1887 Captain E D Alston.

CITY OF ADELAIDE was laid-up in 1887 as a result of increasing competition by steamships and the opening of the Suez Canal in 1870. in 1889, she was sold to T Dixon and Son of Belfast, cut down to a barque rig and used for the

carriage of timber on the North Atlantic Run. According to contemporary remarks, the change of rig was of advantage in that it reduced the number of crew. Strangely enough, the cut-down of rig did not greatly reduce the speed of this fine vessel. Sold in 1893 for £1750, *CITY OF ADELAIDE* was reduced to a hulk and became a cholera isolation hospital for the Southampton Council. 1922 brought another owner when she was purchased by The Admiralty for £2500. Towed to Irvine in the Firth of Clyde for refit, she was converted for use as a naval drill ship and fitted with guns, search-lights, torpedo and wireless equipment. Unfortunately, the name 'ADELAIDE' was in use and the vessel was re-named and commissioned as *HMS CARRICK* at Greenock in May 1925.

During the Second World War, *CARRICK* was an accommodation ship and is well remembered by the officers and sailors who lived aboard her at Greenock. A further use was as a training facility for RNVR and Defensively Equipped Merchant Ship (DEMS) personnel. By the end of the war, *CARRICK* was a headquarters for the WRNS. After the declaration of peace, a decision was made to pay her off and send her to the breakers.

The proposed establishment of the RNVR Club of Scotland in 1946 was being held up by the lack of suitable premises. During the search for accommodation, the club learnt that *CARRICK* was berthed in the James Watt Dock at Greenock on her way to the ship-breakers. Visits to London and the efforts of three naval officers (Admiral Sir Charles Morgan, Vice Admiral C S Holland and Commodore the Duke of Montrose) saved the old ship and she was presented to the RNVR Club of Scotland by the Admiralty in 1947.

On 26 April 1948, Operation 'ARARAT' commenced when *SV CARRICK* was towed from Greenock to Messrs Harland and Wolff's yard at Scotstoun for refit and conversion. Much of the work was carried out due to donations, and on completion of the refit, *CARRICK* was towed to a berth at the Customs House Quay at Glasgow and the club opened by Admiral of the Fleet the Viscount Cunningham of Hyndehope. She was moved again in 1954 to her permanent berth at Carlton Place.

Three light alloy masts have been fitted and, to complete the outside appearance, a figure-head and sharks tail have been set in position. The figure-head is that obtained from the sail trader *TRIAD* and the sharks tail presented by a South African RNVR officer.

In his book *Veteran Ships of Australia and New Zealand*, Graeme Andrews records that a number of Port Adelaide ship lovers attempted to obtain *CARRICK* for use as a floating museum. Although this scheme came to nothing, *CARRICK/CITY OF ADELAIDE* is still well remembered in South Australia. On Thursday 17 November 1983, a copy of the Arms of the City of Adelaide was presented to the old ship on behalf of the citizens of Adelaide.

Robin Pennock

SV CARRICK.

Courtesy: RNVR Club of Scotland

SEVERAL ASPECTS OF SEA MINES

by Mike Turner RAN Research Laboratory

POPULAR MISCONCEPTIONS

A Common Misconception

One common misconception about sea mines is that their basic role is to sink ships and submarines. A sea mine is a potentially hazardous underwater device which is laid to deny safe passage to ships and/or submarines. A mining campaign is normally regarded as completely successful if any enemy does not challenge the minefield, and there are no direct losses. There are excellent examples in World War II of successful mining operations against the Japanese which did not result in any direct losses, ports simply being closed due to the lack of an adequate mine countermeasures (MCM) capability.

Targets sunk or damage per mine laid is not a useful measure of minefield effectiveness, national 'hurt' per mine laid being more appropriate. The US mining of Haiphong in World War II and the Vietnam War are good examples of the national hurt far exceeding actual losses (actually zero in the Vietnam War). Some war historians even compare 'ships sunk per mine' with 'ships sunk per torpedo'. A submariner could hardly expect the former to exceed the latter, especially in strategic operations.

One of the popular myths in mine warfare papers is that 'mines sank more AXIS ships than any other weapon in World War II'. This statement is only true for coastal waters in North West Europe (BR 1736 (56) (1) page 768).

Another Misconception

Mines are often regarded as being based on unique hardware having no similarity to other weapons. This was certainly true in World War 1 when mines were typically 'buoys' with horns, and quite distinct from other weapons. Even in World War II mines had little in common with other weapons. Modern sea mines are distinctive by function rather than general hardware. Examples include:

- Bombs — a 'bomb conversion kit' converts a standard bomb into a sea mine (and/or a land mine).
- Rockets — special buoyant rockets (rising mines) are laid, tethered to a sinker, and on receipt of a suitable target signal ('signature') the rocket motor is ignited, the rocket is released from its sinker and travels towards the target at high speed.
- Homing Torpedoes — an example is the US CAPTOR mine in which a Mk 46 homing torpedo is activated on receipt of a suitable target signal.
- Non-Homing Torpedoes — a special torpedo known as a submarine launched mobile mine (SLMM) is launched by a submarine outside a harbour and on coming to rest on the harbour bed acts as a mine.
- Missiles — a SUB HARPOON type missile is released from an underwater 'cocoon' on receipt of a suitable target signal.

DECISION MAKING

Human Control

A mine is a unique weapon in that there is no direct human control during any phase of its actual engagement with a target. A so called 'limpet mine' used by underwater saboteurs against ships is a sabotage charge, not a mine.

Lack of human control of a mine might suggest that it can only be used during declared war. It is important to remember that the lack of human control only applies to the mine layer. The mine *recipient* has control over the fate of the minefield and can elect to challenge the minefield after MCM operations or even without MCM operations ('Damn the torpedoes!'). Alternatively the mine recipient can elect to let the minefield wither on the vine and avoid any possible damage to his ships and submarines by not attempting to transit the minefield.

Modern technology is increasing human control over mines after they are laid. There is

decreasing human control over other weapons, with warfare no longer being 'eyeball to eyeball' and missiles being fired on radar contacts that are never sighted for positive identification. This suggests that the relative role of mines will increase.

An Economic Factor

A country can spend say a million dollars on sea mines suitable for laying by its existing aircraft or submarines, and so induce a potential enemy to invest maybe *hundreds* of millions of dollars in acquiring a viable MCM capability. A country could even acquire a modest stock of sea mines without any particularly serious plan for laying them. By forcing a potential enemy to invest in MCM, the mining country may prevent the potential enemy from acquiring an otherwise preferred strike capability, say guided missile patrol boats.

The Important Psychological Factor

The cessation of sea traffic by mining stems mainly from the all important psychological factor associated with an unseen weapon. Greer and Bartholomew (see reference) explore the notion of a 'psychological warhead' for sea mines in an article which is recommended for both the mine warfare expert and the non-expert.

An example of a psychological warhead is to be seen when a navy has submarines and SLMM. Each time a submarine leaves its home port, the enemy does not know which of its ports, if any, will be covertly mined by initial minelaying, or reseeding, with SLMM. The mathematical risk at any given port for a single submarine mission may be quite low; however, overall maritime planning will be influenced by the uncertainty of submarine mining, especially with SLMM. One specific effect of this psychological warhead of covert mining is that the enemy is forced to dilute his MCM capability over all ports, and will overestimate the risk at most, if not all, ports.

Use of Sea Mines to Contain Conflicts

With increasing human control over sea mines, they may be used to contain conflicts. Sea mines might be used to de-escalate a conflict by separating naval forces and providing a cooling off period. One common role for a civilian police force is separating opposing factions, for example volatile demonstrators and anti-demonstrators. Sea mines may be used as robot policemen to separate two hostile navies. An agricultural analogy to a police minefield would be a fence between two aggressive bulls. If one bull is so aggressive as to charge the fence, then he alone is responsible for his self-inflicted injury. The use of a police minefield, possibly by a super power or even the United Nations, is seen as a possibility due to:

- increased human control over sea mines,
- no possible loss of life unless 'the bull charges the fence', and
- a lowering of legal 'barriers' to mining as nations create precedents.

A third nation could lay protective mines to prevent a naval conflict between two countries spilling over into its own waters.

Mines could be used to prevent a third nation entering the fray between two countries, the potential of sea mines for a 'hands off' role depending on hydrography. The US mining of North Vietnam to prevent seaborne supply of aid by the USSR etc is seen as a relevant precedent lowering legal barriers.

THE FUTURE

As discussed, sea mines are seen as having an increasing role in maritime warfare, including the containment of conflicts. Special mines may be used in low level conflicts where sinking a warship would result in an undesirable escalation. A rising mine which detonates a relatively small explosive charge at the surface is one possibility. Another possibility would be a mine with firing logic to ensure detonation just astern of the target.

Reference

Greer William L. and CDR James C. Bartholomew USN, *Psychological Aspects of Mine Warfare*, Center for Naval Analyses Professional Paper 365/October 1982. DTIC AD A 128244.

CHURCHILL FELLOWSHIPS

Each year, the Winston Churchill Memorial Trust offers opportunities, by the provision of financial support, to enable Australians from all walks of life to undertake overseas study, or an investigative project, of a kind that is not fully available in Australia. This opportunity is provided in furtherance of Sir Winston Churchill's maxim that: "with opportunity comes responsibility".

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Completed application forms and reports from three referees must be submitted by Thursday 28 February 1985.

BOOK REVIEWS

AUSTRALIA'S OVERSEAS TRADE: STRATEGIC CONSIDERATIONS Captain W.S.G. Bateman, RAN Canberra, The Strategic and Defence Studies Centre, Research School of Pacific Studies, ANU, 1984. Pp 184, ill.

This book is the report of a study of strategic aspects of Australia's overseas trade, undertaken between August 1981 and June 1981 by the author under the sponsorship of the Department of Defence, through the Defence Force Fellowship Scheme.

The relevance and importance of overseas trade to Australia's economic well-being is understood and unquestioned — as Mr Justice Enderby (then a Minister of the Whitlam Government) enunciated so sagely: *Traditionally, most of Australia's imports have come from overseas.*

However, the implications for Australia's security of a disruption of this overseas trade, basic though this may appear to the layman, is a neglected aspect of recent Australian strategic thinking. Captain Bateman's study aims at overcoming some of this neglect.

The author examines two aspects: firstly, the economy-wide implications of an involuntary reduction in Australia's overseas trade; and, secondly, the defence-sector implications of such a reduction. More attention in the study is focussed on the first aspect but it also has something to say about the second.

Strategic planning requires analysis of changes occurring elsewhere in the world to determine the implications for Australia's defence policy and the development of force structure in the Australian Defence Force (ADF). Australia's defence planners have tended to react mainly to geo-political factors (eg, Soviet invasion of Afghanistan), but the need for them to take cognizance of economic factors is equally as important.

In using the term 'economic factors', Captain Bateman is not limiting himself to such obvious events as the oil supply crises of the 1970s: he is also referring to such factors as differential rates of economic growth between countries, the growing inter-dependence of nations on international trade and the changing pattern of Australia's trade. These latter three factors are developed during the body of the report.

Captain Bateman believes that there is a direct contribution which a study of overseas trade can make to strategic planning. Such a study could identify our own weaknesses in the field of trade, identify plans and policies and then develop those plans and policies to defeat any attack against (or enemy exploitation of) those vulnerable areas. Having done that, our strategic planners could develop contingency plans which could include stock-piling and/or the identification of substitute materials or substitute sources of supply.

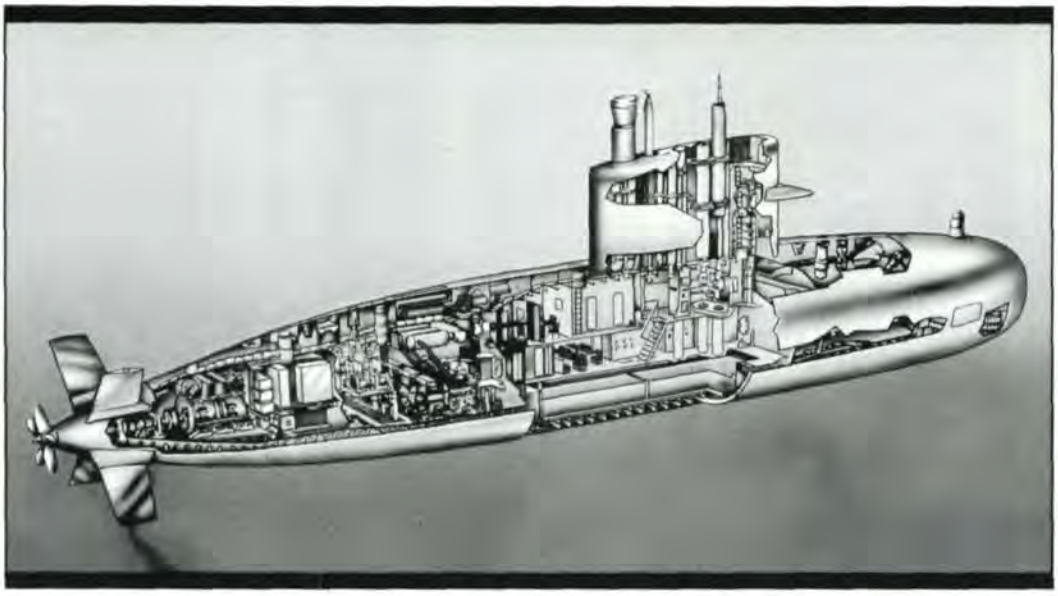
The author reminds us that conflict between nations is not conducted by military means alone and that not all military action has purely military objectives. He refers to Gorshkovs statement that the primary role of the Fleet is against the sources of the enemy's military power, ie, its economic base. While this reminder is essential, Captain Bateman devotes most the development of this theme to defensive and offensive economic warfare, but only obliquely in his Report does he develop the theme that wars may be fought for the acquisition of raw materials for development of an essential manufacturing base, or (as the Marxists would have it) for the development and maintenance of capitalist enterprise.

Defence interest in overseas trade concerns assessment of the ability of domestic industry to support the defence effort during a national security crisis. While Australia is mainly self-reliant in raw materials and energy sources, it is becoming more dependent on other countries for defence-related equipment and machinery.

As Captain Bateman states, arguments for industry protection purely on economic grounds fall on deaf ears (shades of Ricardo and the theories of Comparative and Absolute Advantage) but the usual exclusion clause — to permit defence related industries to develop under a protectionist umbrella to provide for a nations independence from overseas trade disruption in time of war — is becoming more difficult to sustain in view of the high overall economic penalities involved. An additional political factor is that some of our larger trading partners provide de facto Government subsidies to defence Research and Development (R & D) and this has allowed large corporations to carry over this R & D component of costs to its private industry elements — the US aircraft and aerospace industries are cases in point. Thus smaller economies, eg, Australia, have difficulty competing — without protection — with these larger corporations, particularly in defence and defence related industries.

Captain Bateman also discusses protection of maritime commerce; in particular, he quotes from the maritime strategist Mahan that navies exist for the protection of sea commerce — a viewpoint ably supported by history. He examines the strategic implications of maritime protection in terms of type of goods caried, nationality and possible clash of national interests of fleet-owners, and developments in ship technology.

The study leads to discussion of the use of models to simulate the economic consequence of disturbances to trade which could occure in possible defence contingencies. In particular, the author concentrates on the IMPACT project — an inter-agency/inter-departmental economic research project investigating the impact of different types of change on industry structure in Australia. Of the econometric models



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developed in the project, Captain Bateman examines most closely ORANI, which he describes as 'the core of the (IMPACT) project and consisting of a disaggregated, input-output industry sector model concerned primarily with levels of individual industry outputs, exports, imports, intermediate input requirements, employment demand, disaggregated investment relative prices and employment by occupation'!

The author concludes that the ORANI model shows that defence contingency planning must not consider only direct defence requirements — analysis of the requirement may lead to the wrong conclusion if it were to be confined only to the industries directly affected by defence requirements. He also points out that the model is limited in that it is driven by data collected in the past and ignores unquantifiable functions and random events. Nevertheless, although it is only an aid to strategic study, it is a valuable aid.

Older style 'waffle' economics was always open to the charge laid by the Queensland Premier that 'if you laid all the economists in Australia end to end they couldn't reach a conclusion'. The development of econometric models aimed to change all this. But, as outlined in the previous paragraph, the author has rounded on the fundamental reasons that such models can never be other than 'valuable aids'.

Editorially, the book could be improved: there are typographical errors, there is no index, and tabulated data is presented in a mishmash of forms (a practice which militates against easy comparison of data).

Nevertheless, Captain Bateman's report is a valuable addition to the literature on Australia's strategic policy. It is by no means a definitive treatise but it highlights another dimension to the subject, a dimension which should be developed and brought more into the realm of public discussion. As Captain Bateman points out, our policy makers are, at least overtly, more concerned with reaction to changes in geo-political factors in terms of hardware requirements and ADF structure — there is more to strategic planning than that.

Denis Woodward

HMAS SYDNEY – FACT, FANTASY, FRAUD. By Barbara Winter, Brisbane Boolarong Publications, 1984.

Here is another chronicle of the events surrounding the mysterious sinking of *HMAS SYDNEY*, with all hands, in 1941. We have had several such reviews and, with the passage of time, they have become less and less emotional. This book is a scholarly approach, done over a long period, and documented well. It shows where some errors of translation, interrogation, recording and judgement could have occurred in the questioning of the survivors from the German raider *KORMORAN*. It also shows, in a skilful style, where some of the more emotional stories lose their bases in fact.

In short, the book is written from the point of view of a careful historian, and cuts neatly through the evidence about the disaster. Barbara Winter has done her job well and has set another bench mark in naval history work. The story of that fateful exchange, off Shark Bay, Western Australia, is well documented in the book. The supporting illustrations and photography vividly bring back one of the greatest tragedies of Australia in wartime.

The structure of the book gives a hint of the sympathies of the authoress. Of nearly three hundred pages, only about one third is written about the title, *HMAS SYDNEY*. The remaining majority is about the raider *KORMORAN* and its activities during the war. When one considers that Barbara Winter has strong links with Europe and indeed studied in Germany, this is hardly surprising. Perhaps her book could be translated and read with great interest in the home country of the survivors of the *KORMORAN*.

It is a book which needs study and is lightened by various dramatic pictures — a Viking funeral is one of the most dramatic, referring to the disappearance of the burning *SYDNEY* over the horizon, never to be seen again.

As with all carefully researched books of this nature, there are lessons to be learnt. The haphazard and incompetent early questioning of the survivors of the German raider gave rise to many of the initial emotions and rumours. The handling of subsequent interrogation and the allusions to possible fraudulent dealing with evidence shows that such cover-up actions do not stand the test of time.

Barbara Winter exhibits diligent research and analysis. Her book is a model for naval historians.

L.H. Pyke

ON THE COAST: MARITIME INDUSTRY LIFE AND LANGUAGE. Vin Darroch. Melbourne, Lothian, 1984. 160 pp, ill, $9.95.

That *On the Coast* is Vin Darroch's testimony to a life of close association with the sea in general, and the Australian maritime industry in particular, is obvious from the intensity and breadth of the anecdotes, vignettes and terms with which he graces this book. Nostalgia roams the pages.

The author's aim is to record a slice of Australian maritime history in the form of work terms, expressions, slang, and nicknames for people and places on the waterfront and at sea; its emphasis is on the Australian waterfront during the period 1900-1982.

The book is organised into 11 chapters (Seaman and the Deck; Cooks and Food at Sea; Sex, Drink and the Hereafter; . . .). Each chapter contains a glossary of terms, interspersed with anecdotes (many hopefully apocryphal) mottoes, histories, 'idiocies', shanties and illustrations.

As a result, we have a book which is quite different to Lew Lind's *Sea Jargon*. Vin Darroch's book is one for browsing through, for light relief, for absorbing the feel of a way of life almost gone, and for chuckling over. On this latter point, this reviewer will, if ever at sea with 'Bass Strait Cowboys', be forever aware of the advantages of 'circling the head' and will avoid 'the bum steer'.

Its format and its lack of an index make the search for any particular phrase difficult; but, this book was never intended as a dictionary. An inexpensive addition to one's library, but not for the book-case. This book — like *The Caine Mutiny, Up the Organisation* and *Yes Minister* — should be kept in the office, and referred to on those occasions when the bureaucratic process begins to weigh most heavily upon us.

Denis Woodward

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